Approved For Release 2011/05/31 : CIA-RDP88-01418R000200130011-6

MICROWAVE PATH SURVEY REPORT

HATTONTOWN - TYSONS CORNER
HATTONTOWN - CIA LANGLEY

Prepared for
OVERSEAS TELECOM

AUGUST 1986

COMSEARCH®

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PREFACE

Within this report is contained relevant information gathered as a result of both field and office effort. The sum of these elements comprise what is termed a Microwave Path Survey.

The survey was conducted in May 1986 for Overseas Telecom and was performed to furnish physical site and path data required to evaluate a proposed microwave system between Hattontown, Tysons Corner and Langley. Field work, calculations, drafting, and documentation were prepared by:

COMSEARCH, INCORPORATED
1307 Glenville Drive
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INTRODUCTION

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INTRODUCTION

1.1 SCOPE OF WORK

This report describes a field survey performed by COMSEARCH, INC. for Overseas Telecom during May 1986. The survey covers three sites and three paths. Overseas Telecom is planning to use 11.2 GHz microwave equipment.

1.2 METHOD OF SURVEY

Path profiles were developed from 1:24000 topographic maps. Critical points along the path and site elevations were extrapolated from the same maps and were verified by the following methods:

a. Scaled map distance with vertical and horizontal triangulation.

b. Measured distance with vertical and horizontal triangulation.

c. Leveling from known elevations.

The heights of trees on the critical points were measured and recorded on the path profiles. Allowance was made for future growth depending upon the established vegetation of the region.

1.3 PATH CRITERIA

The antenna heights on the profile were established using criteria stipulated by Comsearch, Inc. that the path centerline should clear all existing obstructions with effective earth radius (k) and Fresnel clearance as follows:

a. Top antenna to top antenna

Effective earth radius (k)	=	1.0
Fresnel clearance zone radius	=	0.6
Additional tree growth	=	10 feet

1.4 SITE TOPOGRAPHIC MAPS

The location of each site has been plotted on a 1:24000 topographic map with associated paths to adjacent sites indicated.

1.5 SITE LOCATION MAPS

For all sites, a site location map is included showing the best access route to the proposed or existing sites indicating distance to major highways or towns.

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1.6 SITE PLOT PLANS

A plot plan provides detailed information showing the existing or required area and the positioning of the existing or proposed tower and building. Notes are made regarding pertinent information concerning the area.

1.7 SITE INFORMATION SHEETS

The site description provides detailed information for the terminal. Information is recorded regarding the topographic map where site is located, land owner and geodetic coordinates. Inverse position computations from the geodetic coordinates of related terminal(s) provide the forward and reverse azimuth. The site elevation and method used to determine it are noted. Description of the physical terrain of the site, soil condition, access road information, building information (proposed or existing), and electrical power information is also included. The proposed or existing tower height , antenna centerlines and sizes are noted. A general comment is made at the end regarding any pertinent data that may have an effect on design or construction.

1.8 PATH DESCRIPTIONS

The path description provides detailed information for both terminals of each microwave path. Accompanying the path description are notes on the method used to define the critical points, reflection point terrain descriptions, and the type of terrain the path traverses.

1.9 SPECIAL CONSIDERATIONS

The clearance criteria used for this survey is based on the predicted propagation conditions for the area, the terrain the path traverses and the type of service for the system. This clearance criteria is 0.6 Fresnel zone above a true earths radius factor (K=1). Abnormal propagation is not expected for this area.

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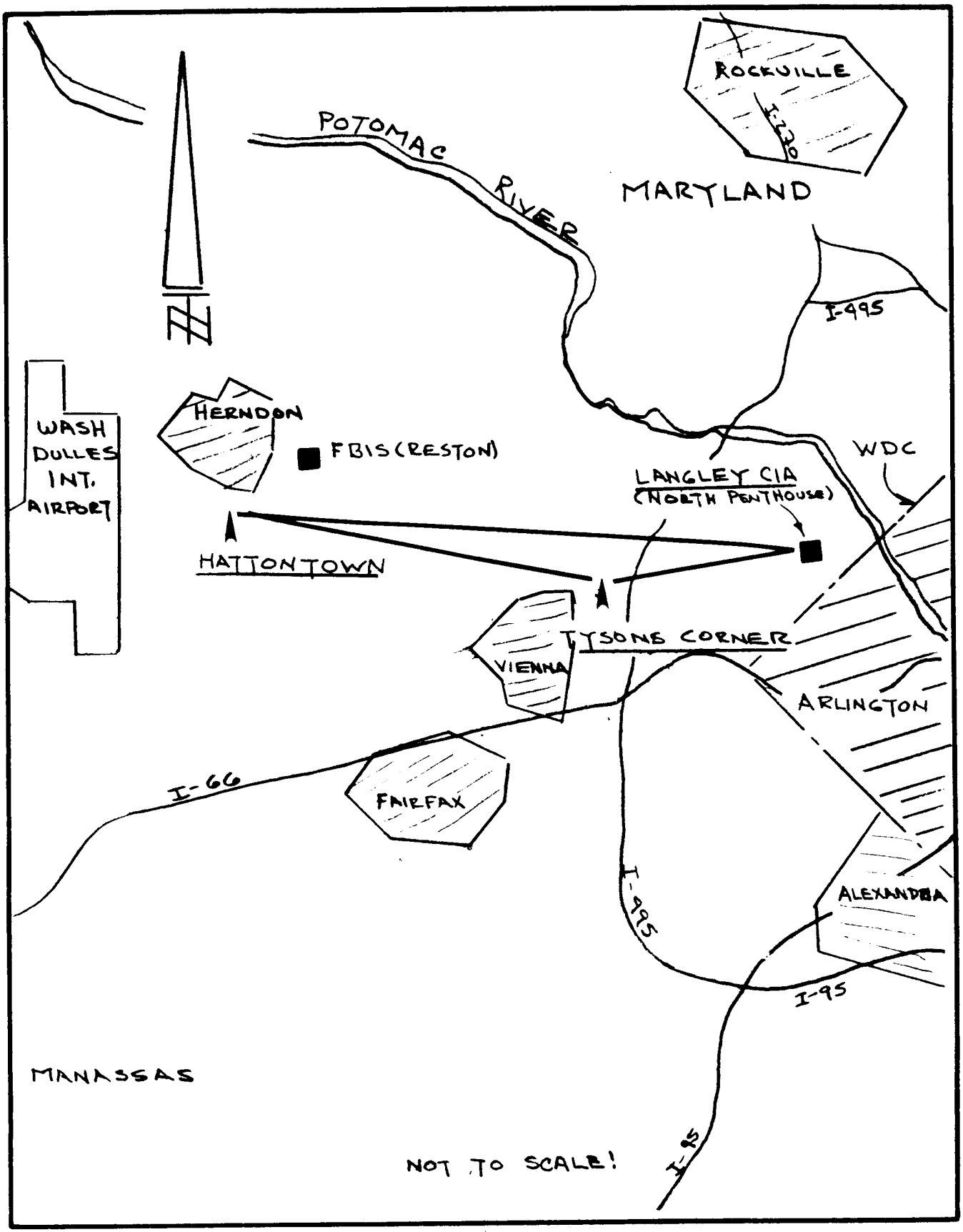

SYSTEM MAP

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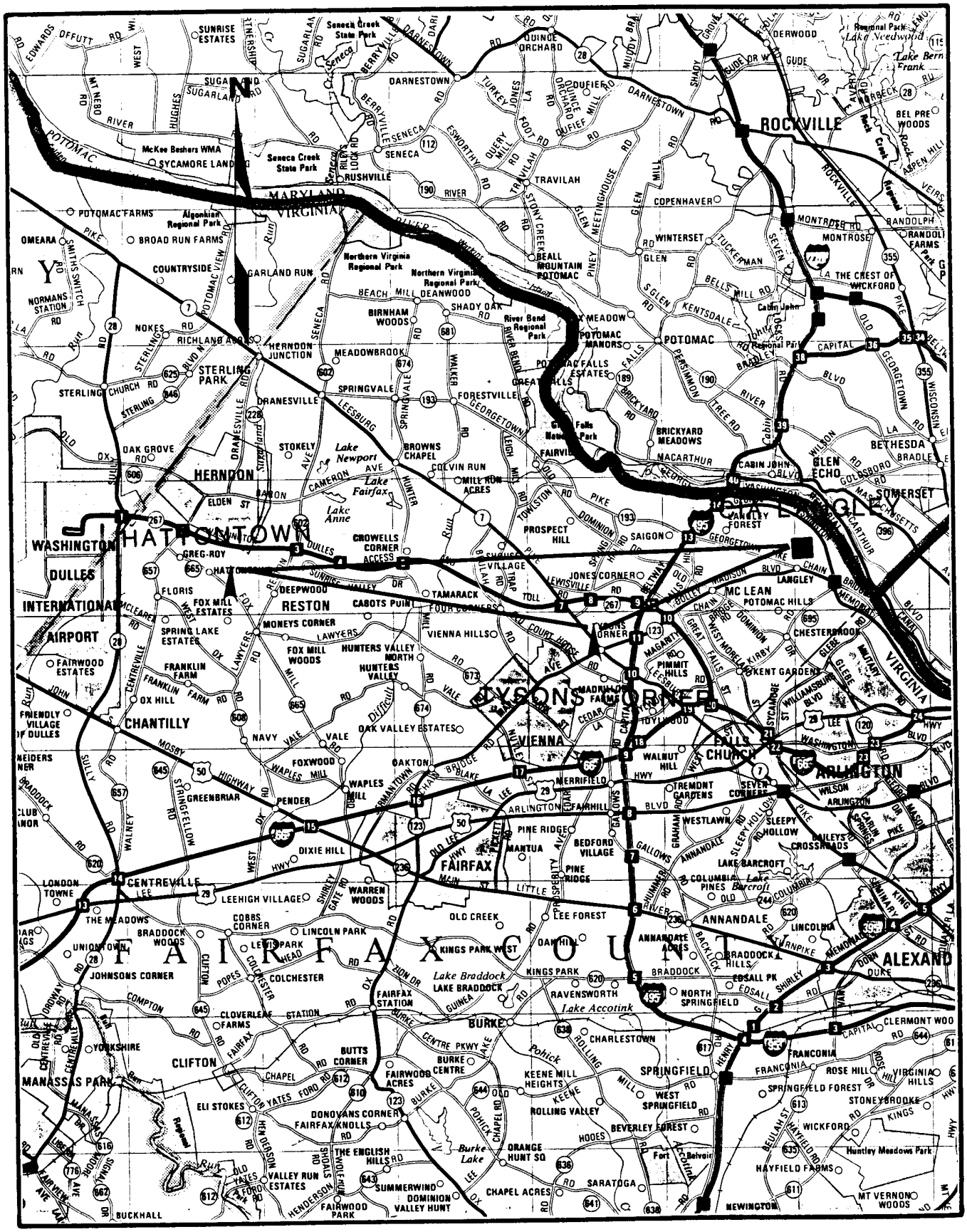
FAIRFAX COUNTY
HATTONTOWN
TYSONS CORNER
MARYLAND
VIRGINIA
WASHINGTON DULLES INTERNATIONAL AIRPORT
ROCKVILLE
GAITHERSBURG
HERNDON
RESTON
CHANTILLY
CENTREVILLE
FAIRFAX
VIENNA
FALLS CHURCH
ARLINGTON
ALEXANDRIA
MANASSAS PARK
SPRINGFIELD
ANNANDALE
MC LEAN
BETHESDA
POTOMAC
STERLING PARK
POTOMAC FARMS
SUNRISE ESTATES
DARNESTOWN
QUINCE ORCHARD
TRAVILAH
SENECA
RUSHVILLE
BEALL MOUNTAIN POTOMAC
COPENHAVER
WINTERSET
MONTROSE
OMEARA
BROAD RUN FARMS
COUNTRYSIDE
GARLAND RUN
DEANWOOD
SHADY OAK
BIRNHAM WOODS
POTOMAC MANORS
NOKES
RICHLAND ACRES
HERNDON JUNCTION
MEADOWBROOK
SPRINGVALE
FORESTVILLE
DRANESVILLE
STERLING CHURCH RD
OAK GROVE
STOKELY
BROWNS CHAPEL
COLVIN RUN
MILL ROAD ACRES
PROSPECT HILL
SAIGON
CROWELLS CORNER ACCESS
GREG-ROY
DEEPWOOD
TAMARACK
CABOTS POINT
FOX MILL ESTATES
SPRING LAKE ESTATES
MONEYS CORNER
VIENNA HILLS
FOX MILL WOODS
HUNTERS VALLEY NORTH
HUNTERS VALLEY
FRANKLIN FARM
OX HILL
FAIRWOOD ESTATES
FRIENDLY VILLAGE OF DULLES
OAK VALLEY ESTATES
NAVY VALE
FOXWOOD
WAPLES MILL
OAKTON
GREENBRIAR
PENDER
DIXIE HILL
LONDON TOWNE
LEEHIGH VILLAGE
THE MEADOWS
BRADDOCK WOODS
COBBS CORNER
LINCOLN PARK
UNION TOWN
JOHNSONS CORNER
LEWIS PARK HEAD
COLCHESTER
POPES
CLOVERLEAF FARMS
FAIRFAX STATION
YORKSHIRE
CLIFTON
BUTTS CORNER
MANASSAS PARK
ELI STOKES
DONOVANS CORNER
FAIRFAX KNOLLS
THE ENGLISH HILLS
VALLEY RUN ESTATES
SUMMERWIND
DOMINION VALLEY HUNT
FAIRWOOD PARK
BUCKHALL
OLD CREEK
LEE FOREST
KINGS PARK WEST
KINGS PARK
LAKE BRADDOCK
RAVENSWORTH
NORTH SPRINGFIELD
BURKE
BURKE CENTRE
KEENE MILL HEIGHTS
ROLLING VALLEY
WEST SPRINGFIELD
BEVERLEY FOREST
ORANGE HUNT SQ
CHAPEL ACRES
SARATOGA
NEWINGTON
CHARLESTOWN
FRANCONIA
SPRINGFIELD FOREST
STONEYBROOKE
WICKFORD
HUNTLEY MEADOWS PARK
HAYFIELD FARMS
MT VERNON WOODS
PINE RIDGE
MANTUA
BEDFORD VILLAGE
LAKE BARCROFT
PINE RIDGE
TREMONT GARDENS
WESTLAWN
SLEEPY HOLLOW
BAILEYS CROSSROADS
WALNUT HILL
MERRIFIELD
ARLINGTON
FAIRHILL
SEVEN CORNERS
ANNANDALE ACRES
BRADDOCK HILLS
EDSALL PK
NORTH SPRINGFIELD
MADRILLON FARMS
IDYLWOOD
CEDAR LA
CAPITAL BEL
MAGANTY
PIMMIT HILLS
KENT GARDENS
CHESTERBROOK
POTOMAC HILLS
LANGLEY
LANGLEY FOREST
JONES CORNER
LEWISVILLE
TOLL
FOUR CORNERS
COURT HOUSE
VILLAGE
SUNRISE VALLEY DR
DULLES ACCESS
DULLES TOLL
SPRING HILL
BELVAIR
BRICKYARD MEADOWS
MACARTHUR
CABIN JOHN
GLEN ECHO
SOMERSET
WESTMORELAND
GEORGETOWN
FALLS ESTATES
FALLS HILLS
RIVER BEND
RIVER BEND Regional Park
Northern Virginia Regional Park
Algonkian Regional Park
McKee Beshers WMA
Seneca Creek State Park
Lake Newport
Lake Fairfax
Lake Anne
Lake Braddock
Lake Accotink
Burke Lake
Great Falls Park
Cabin John
Rock Creek Park
Regional Park
Lake Needwood
Lake Bernard Frank
Potomac River
Occoquan River
Bull Run
Difficult Run
Accotink
Pohick
Cameron Run
Four Mile Run
Turkey Run
Sugarland Run
Broad Run
Goose Creek
Seneca
Darnestown Rd
Quince Orchard Rd
Travilah Rd
Seneca Rd
Glen Mill Rd
Piney Meetinghouse Rd
Tuckerman
Glen Rd
Bells Mill Rd
Kentsdale Rd
Falls Rd
Persimmon Tree Rd
Brickyard Rd
Old Georgetown Rd
Rockville Pike
Wisconsin Ave
Capital Beltway
Dulles Airport Access Rd
Dulles Toll Rd
Leesburg Pike
Sterling Blvd
Springvale Rd
Walker Rd
Dranesville Rd
Herndon Pkwy
Elden St
Cameron Ave
Hunter Mill Rd
Centreville Rd
Braddock Rd
Sully Rd
Walney Rd
Springfellow Rd
Waples Mill Rd
Oakton
Chain Bridge Rd
Old Lee Hwy
Fairfax Blvd
Main St
Little River Turnpike
Gallows Rd
Graham Rd
Annandale Rd
Columbia Pike
Backlick Rd
Shirley Gate Rd
Prosperity Ave
Hummer Rd
Old Keene Mill Rd
Pohick Rd
Rolling Rd
Burke Centre Pkwy
Guinea Rd
Fairfax Station Rd
Clifton Rd
Ox Rd
Popes Head Rd
Compton Rd
Braddock Rd
Union Mill Rd
Centreville Rd
Manassas Dr
Liberia Ave
Fairview Park Dr
Old Yates Ford Rd
Henderson Rd
Shoals Rd
Valley View Dr
Chapel Rd
Clifton Yates Ford Rd
Hendersonville Rd
Burke Lake Rd
Ox Hill Battlefield
Fort Belvoir
Huntley Meadows Park
Mount Vernon Woods
Lake Barcroft
Columbia Pines
Lake Needwood
Lake Bernard Frank
Rock Creek
Aspen Hill
Veirs Mill Rd
Randolph Rd
Montrose Rd
Rockville
Gude Dr
Shady Grove Rd
Muddy Branch
Darnestown Rd
Seneca Creek State Park
Seneca
Berryville Rd
Darnestown
Turkey Jones La
Foot Rd
Query Mill Rd
Esworthy Rd
Travilah Rd
Stony Creek

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SITE DESCRIPTION

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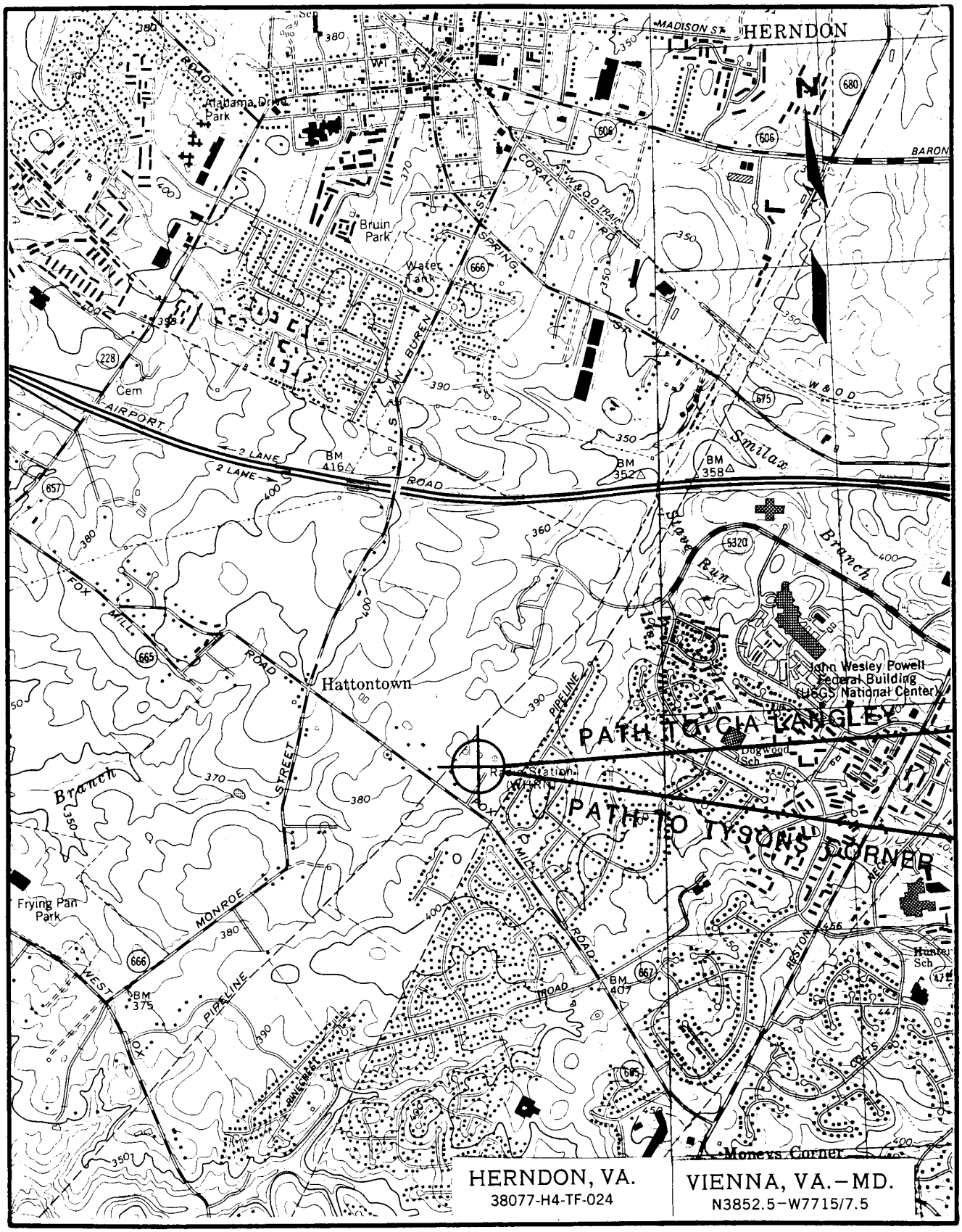

SITE TOPOGRAPHIC MAP
HATTONTOWN

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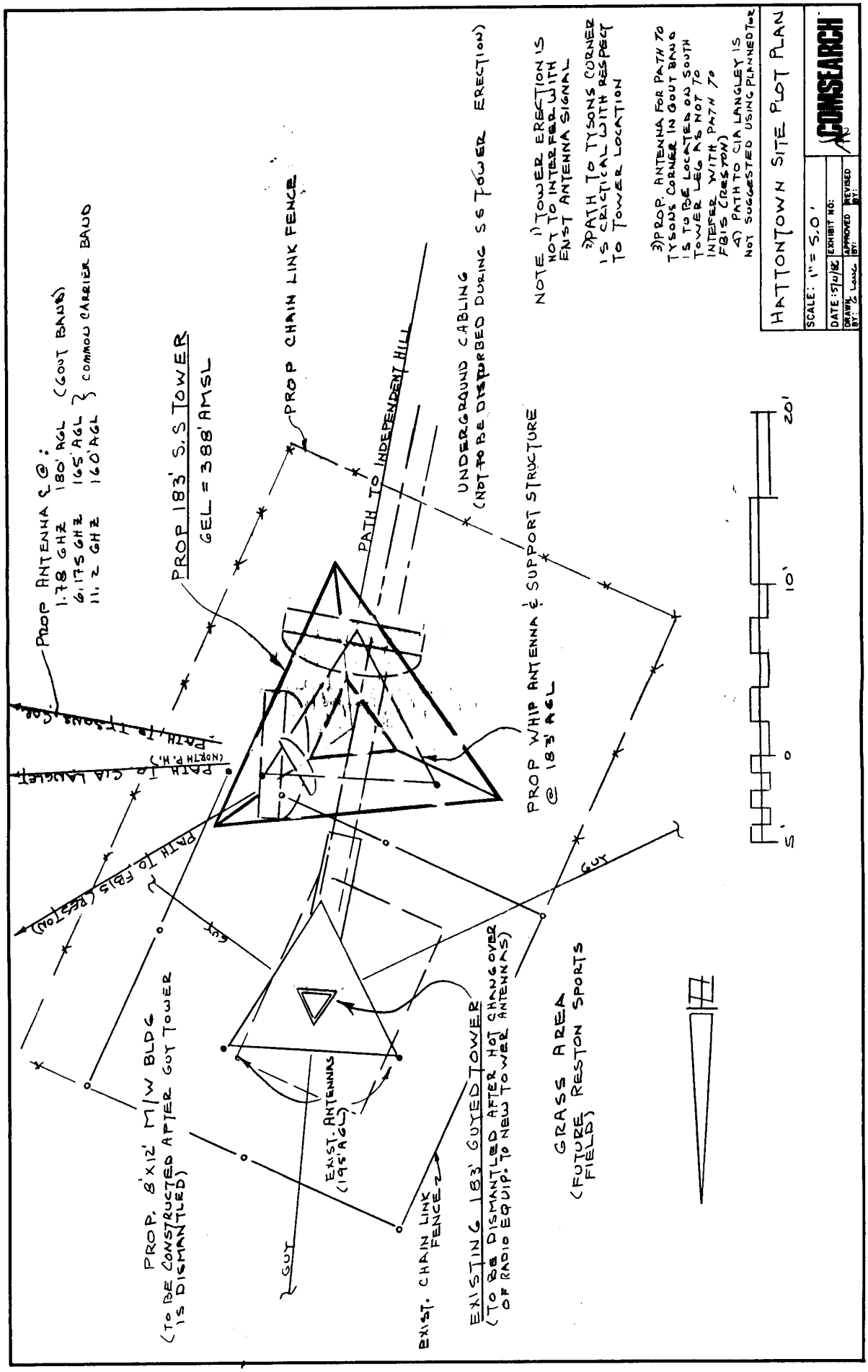
PROP ANTENNA @:
1.78 GHZ 180' AGL (GOUT BAND)
6.175 GHZ 165' AGL } COMMON CARRIER BAND
11.2 GHZ 160' AGL
PROP 183' S.S TOWER
@EL = 388' AMSL
PROP CHAIN LINK FENCE
PATH TO INDEPENDENT HILL
UNDERGROUND CABLING
(NOT TO BE DISTURBED DURING SS TOWER ERECTION)
NOTE 1) TOWER ERECTION IS NOT TO INTERFERE WITH EXIST ANTENNA SIGNAL
2) PATH TO TYSONS CORNER IS CRITICAL WITH RESPECT TO TOWER LOCATION
3) PROP. ANTENNA FOR PATH TO TYSONS CORNER IN GOUT BAND IS TO BE LOCATED ON SOUTH TOWER LEG AS NOT TO INTERFER WITH PATH TO FBIS (CRESTON)
4) PATH TO CIA LANGLEY IS NOT SUGGESTED USING PLANNED TOWER
PROP WHIP ANTENNA & SUPPORT STRUCTURE @ 183' AGL
PATH TO TYSONS COR. (NORTH P.S.)
PATH TO CIA LANGLEY (NORTH P.S.)
PATH TO FBIS (CRESTON)
GUY
PROP. 8'X12' M/W BLDG
(TO BE CONSTRUCTED AFTER GOT TOWER IS DISMANTLED)
EXIST. ANTENNAS (195' AGL)
EXIST. CHAIN LINK FENCE
EXISTING 183' GUYED TOWER
(TO BE DISMANTLED AFTER HOT CHANGEOVER OF RADIO EQUIP. TO NEW TOWER ANTENNAS)
GRASS AREA
(FUTURE FIELD) RESTON SPORTS
0 5' 10' 20'
HATTONTOWN SITE PLOT PLAN
SCALE: 1" = 50'
DATE: 5/31/82
EXHIBIT NO:
DRAWN BY: L. Lowe
APPROVED BY:
REVISED BY:
COMSEARCH

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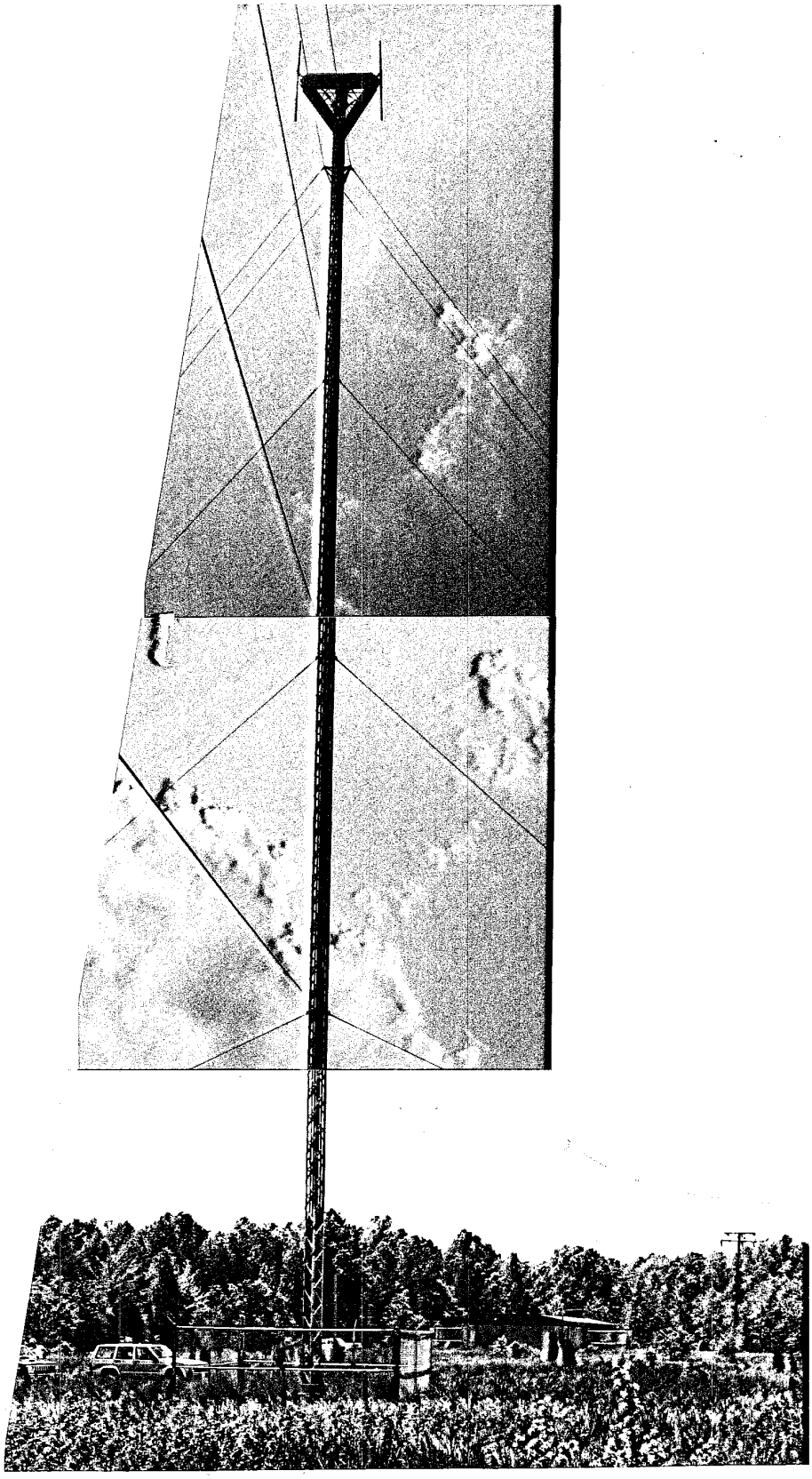
Approved For Release 2011/05/31 : CIA-RDP88-01418R000200130011-6 NTOWN



VIEW SOUTH

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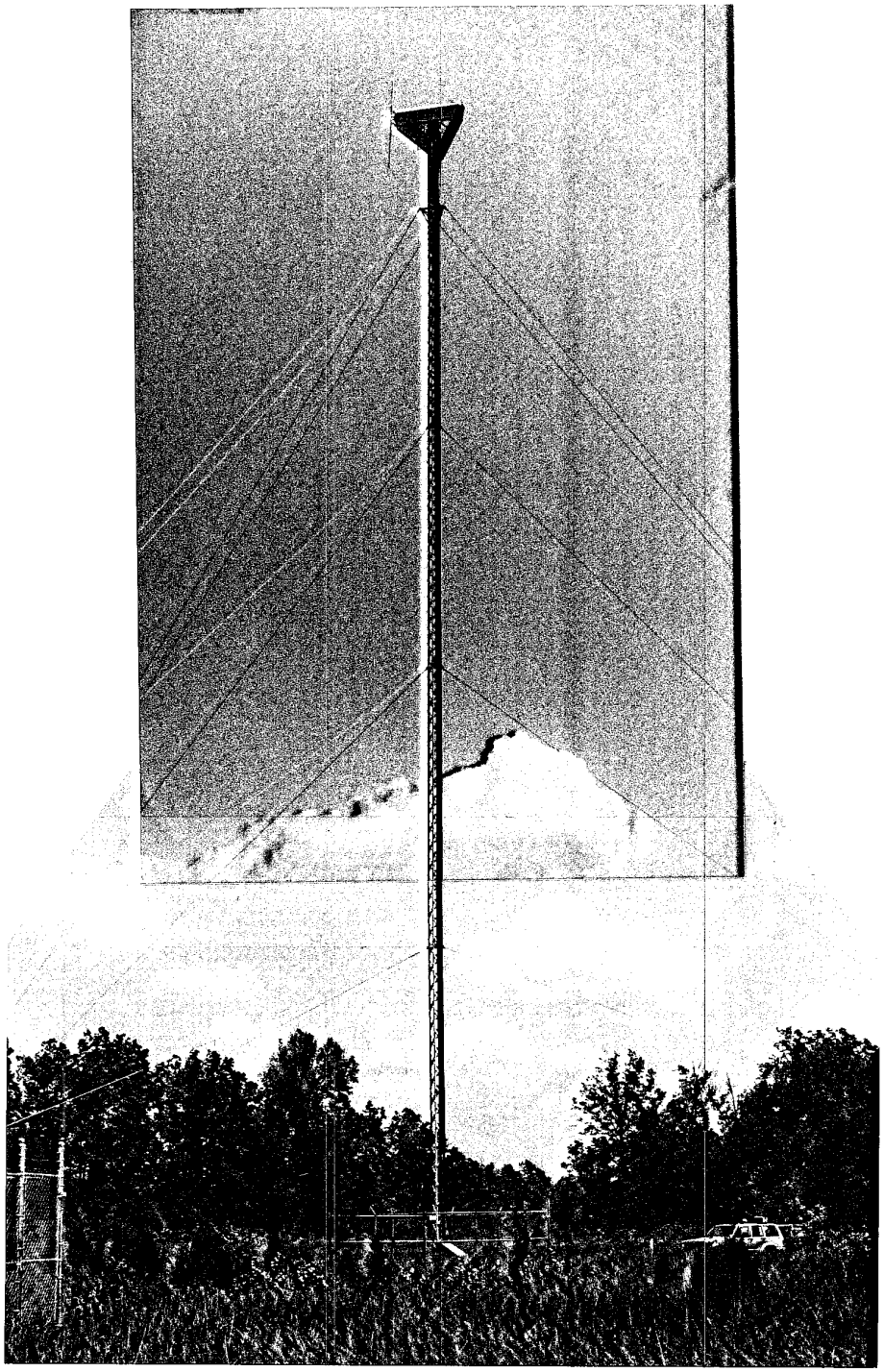

VIEW NORTHEAST

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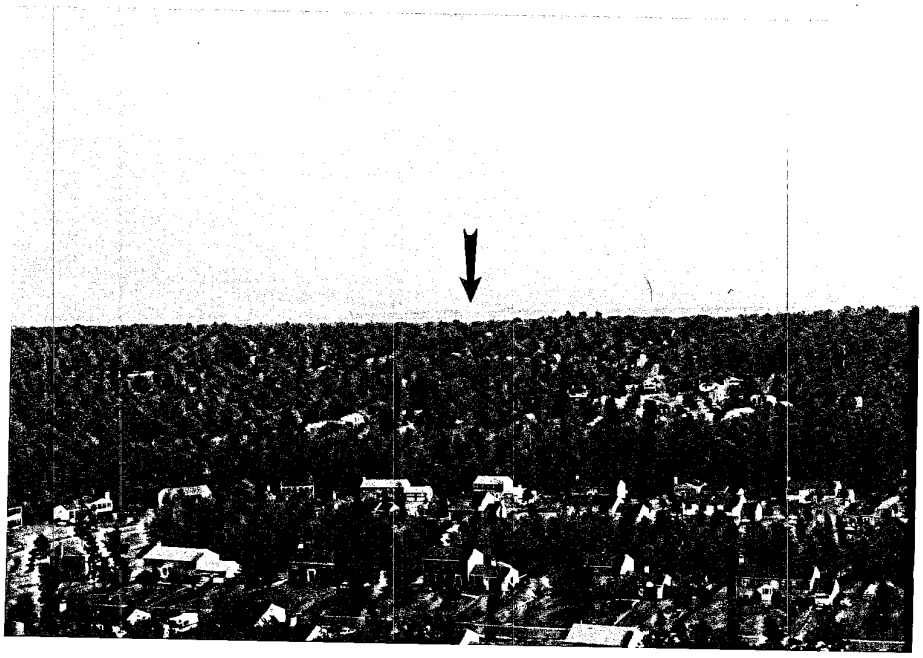
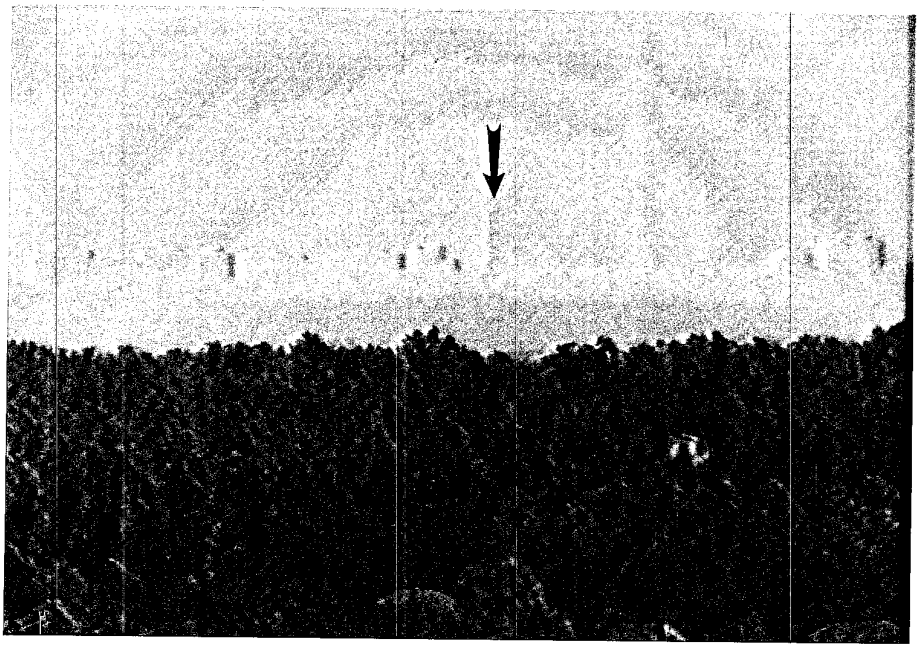


PATH TO TYSON'S CORNER (50 mm)



PATH TO TYSON'S CORNER (400 mm)

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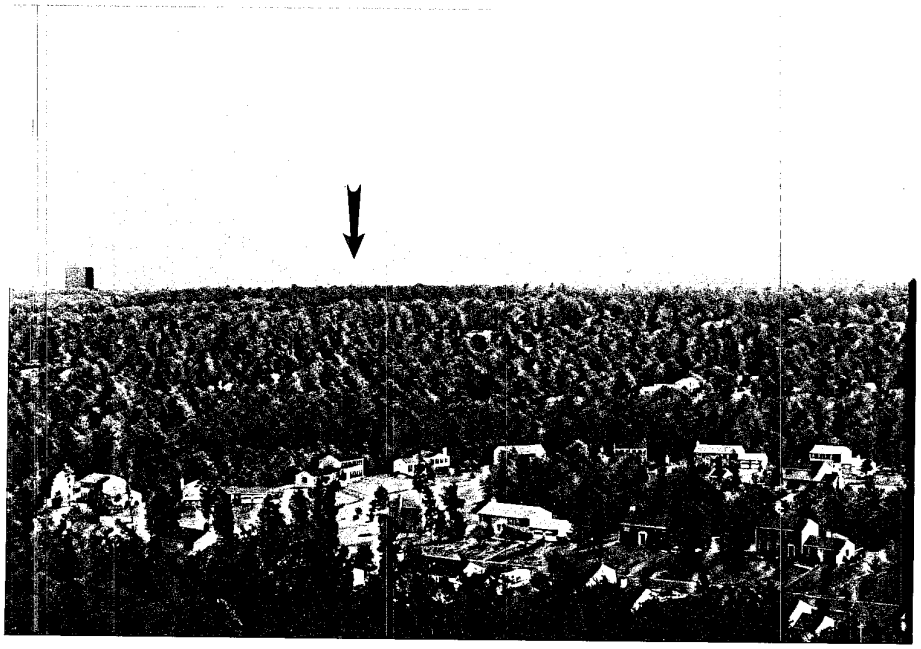
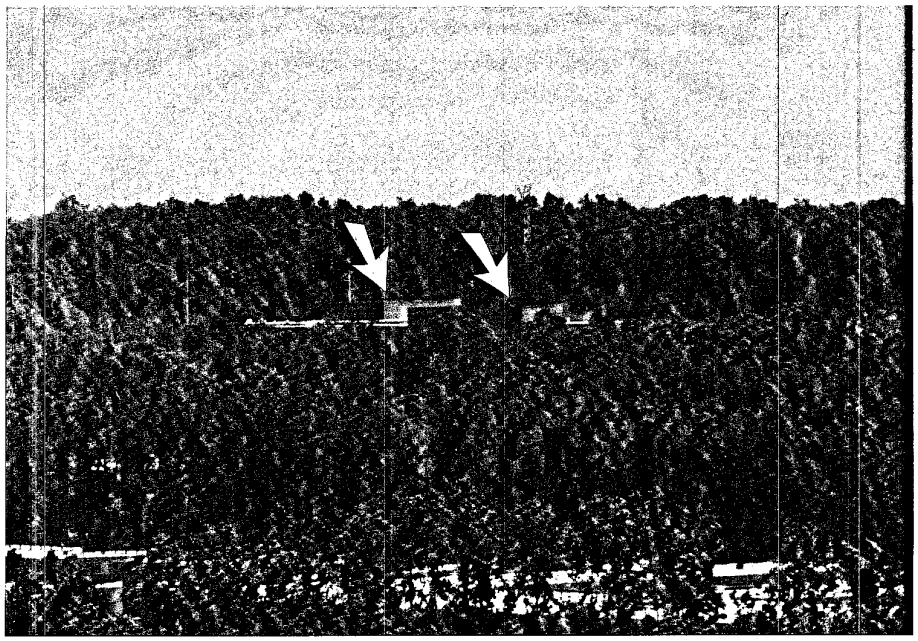
Approved For Release 2011/05/31 : CIA-RDP88-01418R000200130011-6 TOWN



PATH TO CIA LANGLEY



PATH TO FBIS (RESTON)

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PROPOSED MICROWAVE SITE INFORMATION

SITE: Hattontown

SURVEYOR: G. Long DATE: May 1986

REFERENCE MAPS: (Map name, scale)

TOPOGRAPHIC: Herndon, VA. U.S.G.S. 1:24000

CITY:

OTHER:

LOCATION:

STREET ADDRESS: Fox Mill Road

CITY: COUNTY: Fairfax

STATE: Virginia COUNTRY: U.S.A.

IF NOT LOCATED IN A CITY: DISTANCE: 1.9 miles AZIMUTH: 357° (True)

TO CITY OF: Herndon Town Center

OWNER: Bell Atlantic Mobile Systems

GEODETIC COORDINATES:

LATITUDE: 38° 56' 31" N LONGITUDE: 77° 23' 04" W

HOW DETERMINED: Position plotted on 1:24000 Scale Maps

AZIMUTH: (True)

HOW DETERMINED: Inverse Position Computations

TO SITE: CIA Langley	86° 31' 41"
REVERSE:	266° 40' 43"
TO SITE: Tysons Corner	100° 08' 00"
REVERSE:	280° 13' 47"

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SITE ELEVATION AMSL: 388 feet

HOW DETERMINED: Vertical angle from benchmark.

SITE DIMENSIONS: (See sketch)

AVAILABLE: Existing 183 ft. guyed tower.

REQUIRED: Replace with stronger tower.

SITE DESCRIPTION:

Existing 183 foot guyed tower with 2 Omni directional antennas on top and bounded on all sides by pasture ground. The tower is located such that fall radius is inside property.

SOIL CONDITION:

Visual inspection of the soil indicates a clay loam mixture.

ROAD CONDITION:

REQUIRED ACCESS ROAD: Existing

MAXIMUM PERCENT GRADE: Negligible

GENERAL CONDITION OF ROADS TO SITE:

Paved to within 0.1 miles, and gravel continuing to the building. The 240 feet to the tower is native soil.

TYPE OF VEHICLE REQUIRED TO REACH SITE: Any

DISTANCE TO MAIN HIGHWAY: 2.1 miles to Hwy 267 (Dulles Airport Road)

DISTANCE TO NEAREST TOWN: 1.6 miles to Herndon

COMMENTS: (See sketch of access where required.)

Locked gate at entrance.

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BUILDING INFORMATION:

EXISTING: Yes

COMMENTS: Propose placing an 8 x 12 foot portable microwave building by future tower. Existing radio equipment building is located approximately 240 feet from tower base with under ground cabling.

ELECTRIC POWER:

IF AVAILABLE AT SITE: 110/220 Volts, Single Phase, 60 Hertz

IF NOT AVAILABLE AT SITE: (Distance and direction to nearest available power.)

Located adjacent to radio equipment building and approximately 240 ft. from tower base. There AC power to lights, however, a diesel generator is located in the building.

TOWER INFORMATION:

HEIGHT OF EXISTING TOWER: 183 ft. Guyed

REQUIRED HEIGHT: 183 ft. Self-supporting

AVAILABLE GUYING AREA: 80%

AVAILABLE AREA WILL PERMIT: 80% GUYING

AREA REQUIRED FOR 80% GUYING: Not Applicable

GRADE FROM TOWER TOWARDS GUY ANCHORS:

Negligible

OTHER COMMENTS:

New tower is to be constructed as not to interfere with existing tower or cabling. Existing tower will be dismantled after hot change over of antennas.

HEIGHT OF REQUIRED FINAL RADIATOR: (Above ground level)

PATH	HEIGHT	SIZE	TYPE
CIA Langley (N.Penthouse)	205 feet	(6 GHz)	
	200 feet	(11 GHz)	
Tysons Corner	180 feet	(1.78 GHz)	
	165 feet	(6 GHz)	
	160 feet	(11 GHz)	

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TOWER SHIELDING: (List any natural formations or existing man-made structures which would tend to shield the antenna structure for aircraft.)

Existing tower.

AIRPORT INFORMATION: (List all airports within 10 miles.)

AIRPORT	AZIMUTH TO AIRPORT (True)	DISTANCE TO NEAREST RUNWAY
Dulles Airport	270°	14650 feet
Glascock	272°	44100 feet
Centerville	230°	35900 feet

OTHER COMMENTS:

Mr. Harry Fischer and Mr. Ray Pulson relayed the following site history: there were 3 existing 205 foot towers that were disassembled and replaced by the present guyed tower. Fairfax county agreed to this provided only one tower would by built and fenced in with no construction outside the area. The remaining pasture is to become a sports field. A 205 foot height was in violation of FAA restrictions. A new tower replacing the present one is agreeable to the owners.

The maximum height of the tower will be the same as the existing guyed tower due to the FAA restrictions. A 180 foot self supporting tower with a 3 foot concrete base is being planned. Bell Atlantic Mobile will place their antennas identical to the existing configuration. The maximum height of the proposed antennas is 183 feet above ground level at the top rim of the antenna. Due to obstruction on the path to CIA Langley, the path is not recommended.

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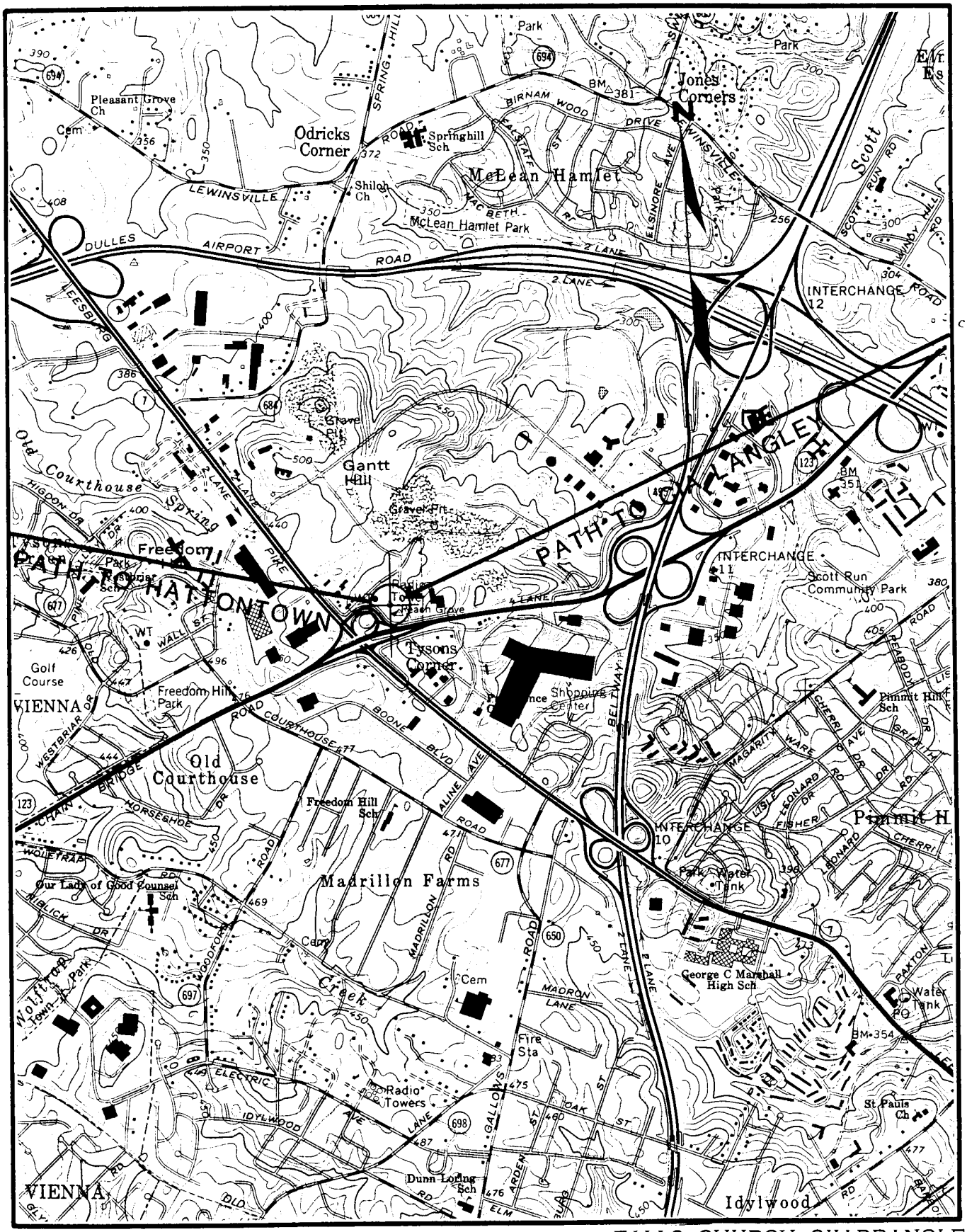

SITE TOPOGRAPHIC MAP
TYSONS CORNER

FALLS CHURCH QUADRANGLE
VIRGINIA – MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

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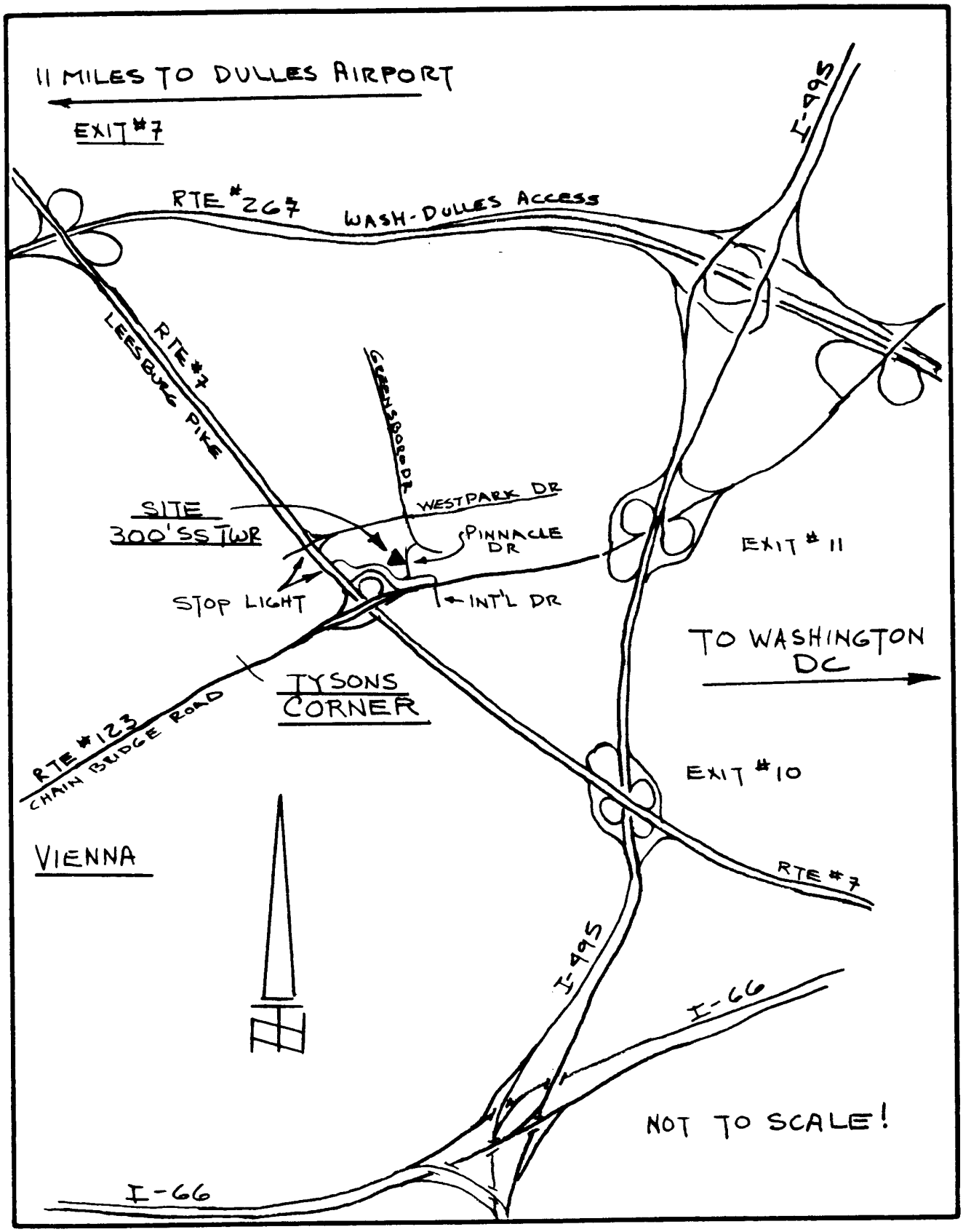

SITE LOCATION MAP
TYSONS CORNER

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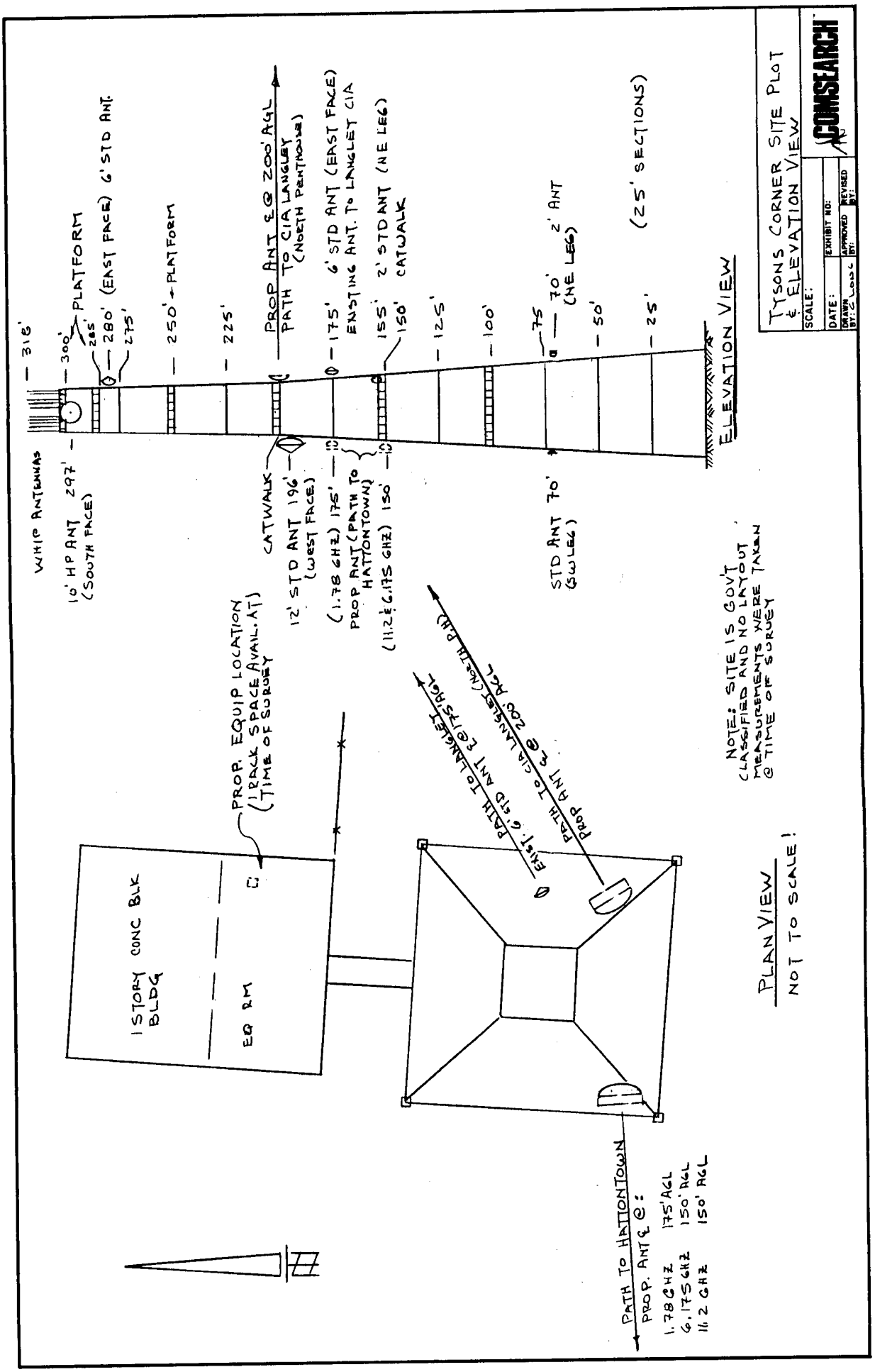

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GOVERNMENT CLASSIFIED SITE

NO PICTURES AVAILABLE

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PROPOSED MICROWAVE SITE INFORMATION

SITE: Tysons Corner

SURVEYOR: G. Long DATE: May 1986

REFERENCE MAPS: (Map name, scale)

TOPOGRAPHIC: Falls Church, VA. U.S.G.S. 1:24000

CITY:

OTHER:

LOCATION:

STREET ADDRESS:

CITY: Tysons Corner COUNTY: Fairfax

STATE: Virginia COUNTRY: U.S.A.

IF NOT LOCATED IN A CITY: DISTANCE: N/A AZIMUTH: N/A

TO CITY OF: N/A

OWNER: US Government

GEODETIC COORDINATES:

LATITUDE: 38° 55' 13" N LONGITUDE: 77° 13' 48" W

HOW DETERMINED: Position plotted on 1:24000 Scale Maps

AZIMUTH: (True)

HOW DETERMINED: Inverse Position Computations

TO SITE: Hattontown	280° 13' 49"
REVERSE:	100° 08' 00"
TO SITE: CIA Langley (N. Penthouse)	63° 46' 15"
REVERSE:	243° 49' 28"

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SITE ELEVATION AMSL: 519 feet

HOW DETERMINED: Vertical triangulation from benchmark to tower.

SITE DIMENSIONS: (See sketch)

AVAILABLE: Existing 300 foot self supporting tower.

REQUIRED: Same

SITE DESCRIPTION:

Self supporting tower and adjacent building are encompassed within a chain link fence that is protected by a 24 hour guard. The area is considered classified by the government. Local area has many high rises and is in the process of being developed.

SOIL CONDITION:

N/A

ROAD CONDITION:

REQUIRED ACCESS ROAD: Existing

MAXIMUM PERCENT GRADE: Negligible

GENERAL CONDITION OF ROADS TO SITE:

Paved

TYPE OF VEHICLE REQUIRED TO REACH SITE: Any

DISTANCE TO MAIN HIGHWAY: 1.3 miles to I-495

DISTANCE TO NEAREST TOWN: N/A

COMMENTS: (See sketch of access where required.)

Access to complex requires prior notice.

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BUILDING INFORMATION:

EXISTING: Yes

COMMENTS: Available space for one rack is located within the building.

ELECTRIC POWER:

IF AVAILABLE AT SITE: 110/220 Volts, Single Phase, 60 Hertz

IF NOT AVAILABLE AT SITE: (Distance and direction to nearest available power.)

N/A

TOWER INFORMATION:

HEIGHT OF EXISTING TOWER: 300 ft. Self-supporting

REQUIRED HEIGHT: 300 ft. Self-supporting

AVAILABLE GUYING AREA: Not Applicable

AVAILABLE AREA WILL PERMIT: % GUYING (Not applicable)

AREA REQUIRED FOR 80% GUYING: Not Applicable

GRADE FROM TOWER TOWARDS GUY ANCHORS:

Not Applicable

OTHER COMMENTS:

Because of high rise office growth in the area, it is proposed having minimum antenna centerlines of 150 feet towards Hattontown.

HEIGHT OF REQUIRED FINAL RADIATOR: (Above ground level)

PATH	HEIGHT	SIZE	TYPE
Hattontown	175 feet	(1.78 GHz)	
	150 feet	(6.175 and 11.2 GHz)	
CIA Langley	200 feet		

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TOWER SHIELDING: (List any natural formations or existing man-made structures which would tend to shield the antenna structure for aircraft.)

Existing structure.

AIRPORT INFORMATION: (List all airports within 10 miles.)

AIRPORT	AZIMUTH TO AIRPORT (True)	DISTANCE TO NEAREST RUNWAY

OTHER COMMENTS:

The existing path to CIA Langley crosses over a new development area, "Tysons II", which has future plans for high rise buildings. Possible path blockage may ensue. This site is considered classified and no pictures or site measurements were allowed.

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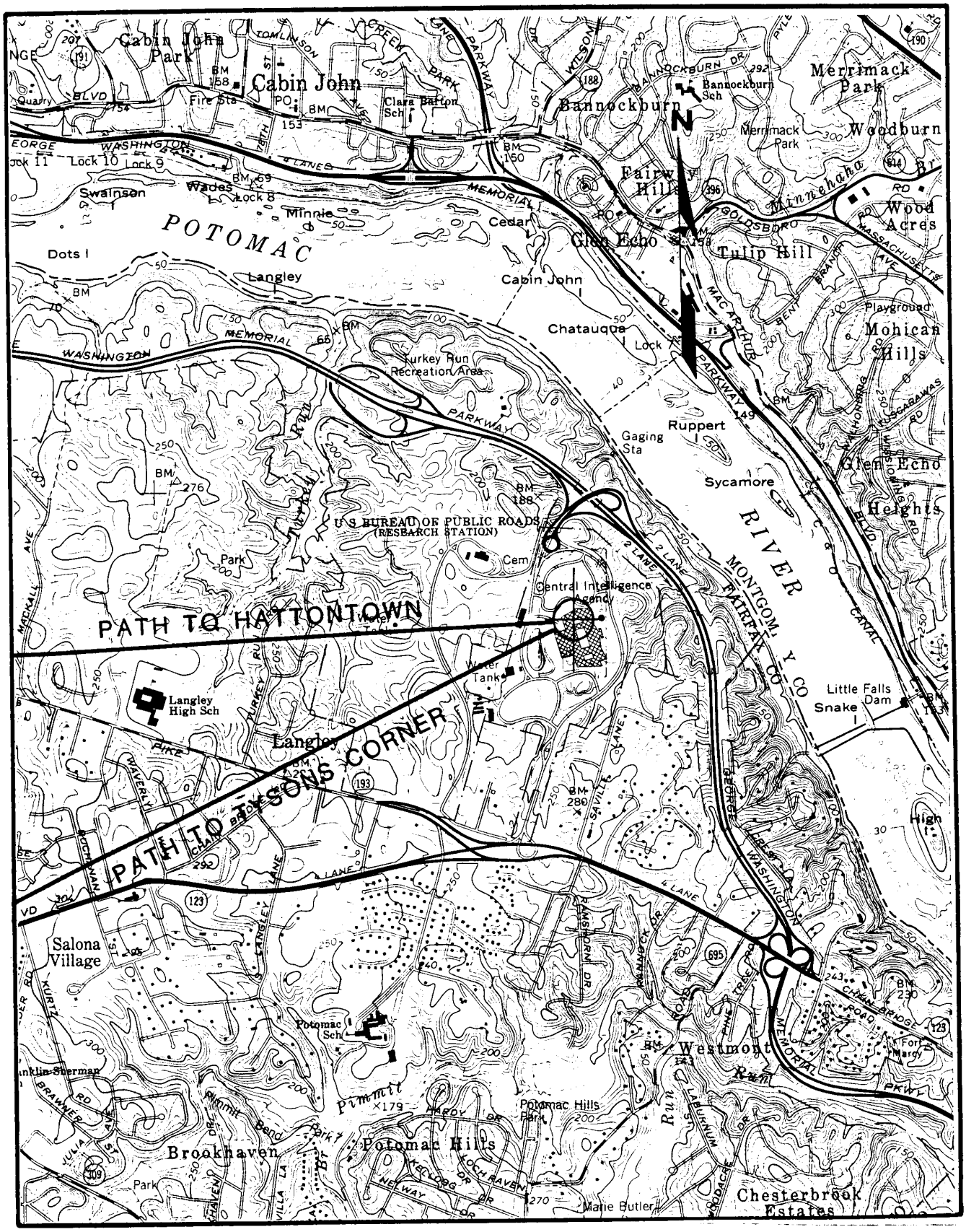

SITE LOCATION MAP
CIA LANGLEY
NORTH PENTHOUSE

FALLS CHURCH, VA.—MD.
N3852.5—W7707.5/7.5

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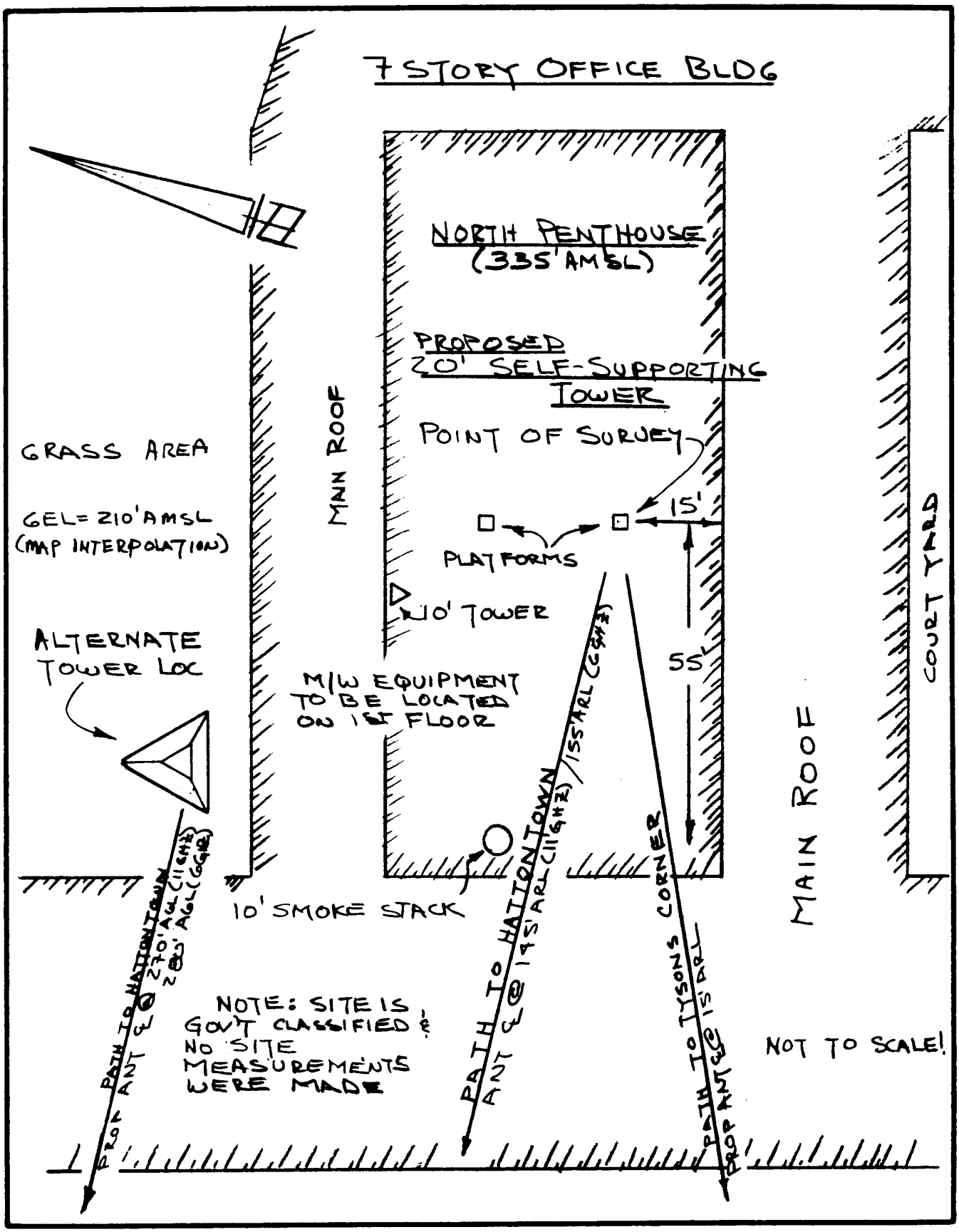
7 STORY OFFICE BLDG
NORTH PENTHOUSE (335' AMSL)
PROPOSED 20' SELF-SUPPORTING TOWER
POINT OF SURVEY
MAIN ROOF
GRASS AREA
GEL= 210' AMSL (MAP INTERPOLATION)
15'
PLATFORMS
10' TOWER
55'
ALTERNATE TOWER LOC
M/W EQUIPMENT TO BE LOCATED ON 1ST FLOOR
COURT YARD
10' SMOKE STACK
PATH TO HAYMARKET ANT @ 270' AGL (11GHz) 280' AGL (6GHz)
PATH TO HAYMARKET ANT @ 145' ARL (11GHz) /155' ARL (6GHz)
PATH TO TYSONS CORNER ANT @ 151' ARL
NOTE: SITE IS GOV'T CLASSIFIED & NO SITE MEASUREMENTS WERE MADE
NOT TO SCALE!

SITE PLOT PLAN
CIA LANGLEY
NORTH PENTHOUSE

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GOVERNMENT CLASSIFIED SITE

NO PICTURES AVAILABLE

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PROPOSED MICROWAVE SITE INFORMATION

SITE: CIA Langley

SURVEYOR: G. Long DATE: May 1986

REFERENCE MAPS: (Map name, scale)

TOPOGRAPHIC: Falls Church, VA. U.S.G.S. 1:24000

CITY:

OTHER:

LOCATION:

STREET ADDRESS:

CITY: Langley COUNTY: Fairfax

STATE: Virginia COUNTRY: U.S.A.

IF NOT LOCATED IN A CITY: DISTANCE: N/A AZIMUTH: N/A

TO CITY OF: N/A

OWNER: US Government

GEODETIC COORDINATES:

LATITUDE: 38° 57' 11" N LONGITUDE: 77° 08' 41" W

HOW DETERMINED: Position plotted on 1:24000 Scale Maps

AZIMUTH: (True)

HOW DETERMINED: Inverse Position Computations

TO SITE: Hattontown	266° 40' 43"
REVERSE:	86° 31' 41"
TO SITE: Tysons Corner	243° 49' 28"
REVERSE:	63° 46' 15"

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SITE ELEVATION AMSL: 210 feet

HOW DETERMINED: Map interpolation for the ground. Controls were brought into the north penthouse roof by vertical angulation. Roof level is 335 feet AMSL. No on site measurements were taken.

SITE DIMENSIONS: (See sketch)

AVAILABLE: North penthouse roof.

REQUIRED: Same on path to Tysons Corner. Recommened tower on ground for path to Hattontown.

SITE DESCRIPTION:

Large 7 story office building with 2 penthouses (700 x 900 ft.), located on a northeast side slope. The site is vegetated by large deciduous trees and bounded on the west by two new buildings under construction. Proposed antenna is to be located on the north side of the building, on top of the penthouse.

SOIL CONDITION:

N/A

ROAD CONDITION:

REQUIRED ACCESS ROAD: Existing

MAXIMUM PERCENT GRADE: Negligible

GENERAL CONDITION OF ROADS TO SITE:

Roads are paved to the site.

TYPE OF VEHICLE REQUIRED TO REACH SITE: Any

DISTANCE TO MAIN HIGHWAY: 0.6 miles to George Washington Parkway

DISTANCE TO NEAREST TOWN: N/A

COMMENTS: (See sketch of access where required.)

Access to complex requires prior notice.

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BUILDING INFORMATION:

EXISTING: Yes

COMMENTS: Equipment is to be located on first floor below the north penthouse.

ELECTRIC POWER:

IF AVAILABLE AT SITE: 110/220 Volts, Single Phase, 60 Hertz

IF NOT AVAILABLE AT SITE: (Distance and direction to nearest available power.)

TOWER INFORMATION:

HEIGHT OF EXISTING TOWER: None

REQUIRED HEIGHT: 20 ft. (on penthouse) Self-supporting

AVAILABLE GUYING AREA: Not Applicable

AVAILABLE AREA WILL PERMIT: % GUYING (Not applicable)

AREA REQUIRED FOR 80% GUYING: Not Applicable

GRADE FROM TOWER TOWARDS GUY ANCHORS:

N/A

OTHER COMMENTS:

If path to Hattontown is opted for, it is suggested placing a self supporting tower, adjacent to the building.

HEIGHT OF REQUIRED FINAL RADIATOR: (Above ground level)

PATH	HEIGHT	SIZE	TYPE
Hattontown	280 feet 270 feet	(6 GHz) (11 GHz)	
Tysons Corner	15 ARL		

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TOWER SHIELDING: (List any natural formations or existing man-made structures which would tend to shield the antenna structure for aircraft.)

None

AIRPORT INFORMATION: (List all airports within 10 miles.)

AIRPORT	AZIMUTH TO AIRPORT (True)	DISTANCE TO NEAREST RUNWAY
Washington National	137°	44300 feet
Bolling Air Force Base	137°	53800 feet

OTHER COMMENTS:

This is a classified area and no photos or site measurements were allowed.

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PATH DESCRIPTION

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PATH DESCRIPTION

STATION A: Hattontown	STATION B: Tysons Corner
LATITUDE: 38° 56' 31" N	LATITUDE: 38° 55' 13" N
LONGITUDE: 77° 23' 04" W	LONGITUDE: 77° 13' 48" W
GROUND ELEV. AMSL: 388 feet	GROUND ELEV. AMSL: 519 feet
HEIGHT OF FINAL RADIATOR CENTER-LINE ABOVE GROUND:	HEIGHT OF FINAL RADIATOR CENTER-LINE ABOVE GROUND:
AZIMUTH A TO B: 100° 08' 00" (True)	AZIMUTH B TO A: 280° 13' 49" (True)
PATH LENGTH: 8.5 miles	FRESNEL ZONE FREQUENCY: 1.78,6.175,11.2 GHz

METHOD OF DETERMINING PROFILE:

The profile was determined from 1:24000 scale mapping supplemented by field data.

METHOD OF DETERMINING CRITICAL POINT LOCATION AND ELEVATION:

Critical points were determined from vertical triangulation from Hattontown and Tysons Corner with direct obstruction measurements.

GENERAL DESCRIPTION OF VEGETATION AND MAN-MADE OBSTACLES ON PATH:

The pathline crosses over gently rolling hills vegetated by alternating groups or groves of mainly deciduous trees and open grass or cleared areas. Possible high rise buildings may be erected in the pathline the last 0.2 miles, with zoning by population density rather than height restrictions. The area is mainly residential with some offices near each end. The critical point at mile 1.05 is a group of deciduous trees. A large tree is located north of the pathline.

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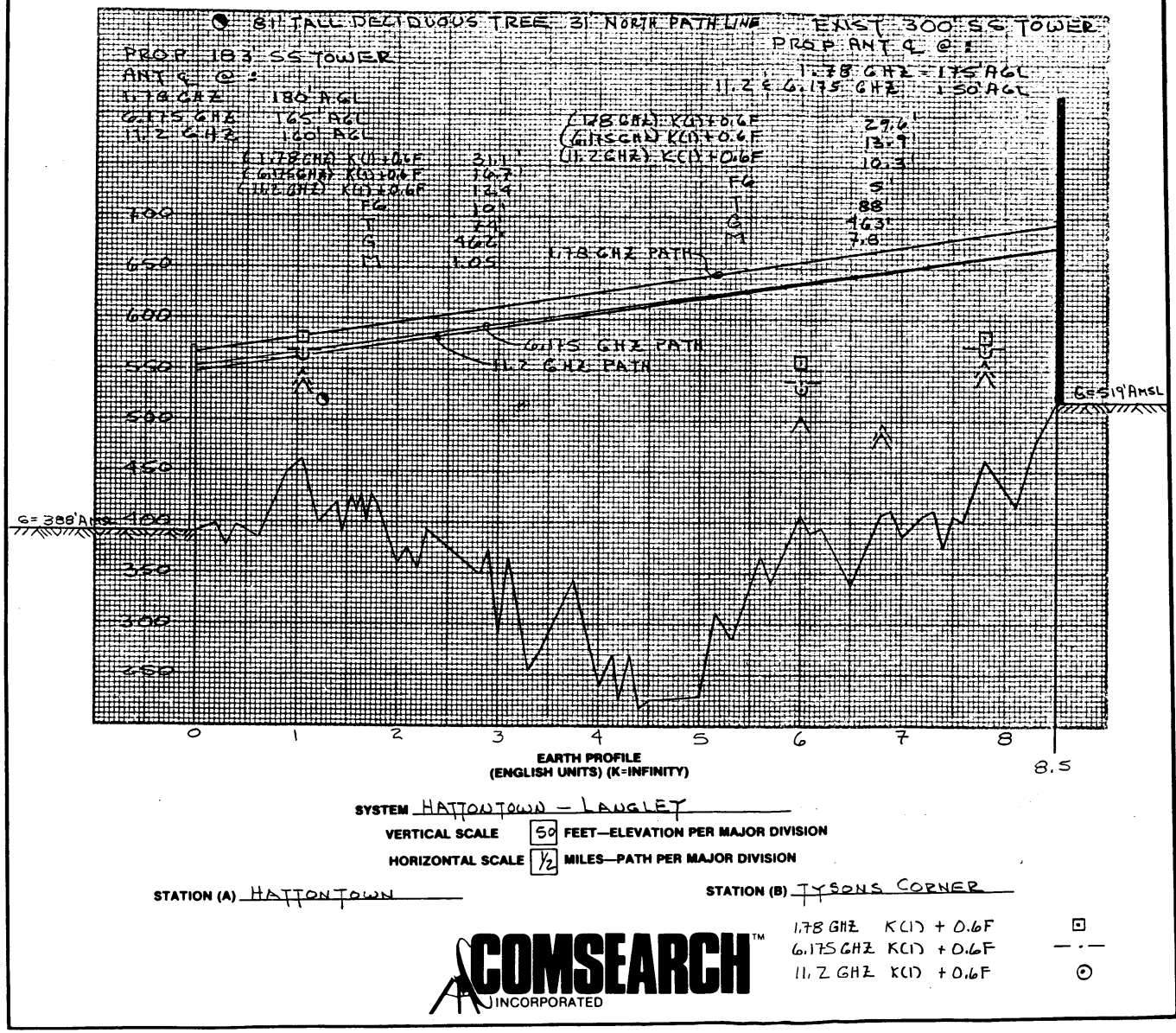

EARTH PROFILE
(ENGLISH UNITS) (K=INFINITY)

SYSTEM HATTONTOWN – LANGLEY

VERTICAL SCALE 50 **FEET—ELEVATION PER MAJOR DIVISION**

HORIZONTAL SCALE 1/2 **MILES—PATH PER MAJOR DIVISION**

STATION (A) HATTONTOWN

STATION (B) TYSONS CORNER

1.78 GHZ K(1) + 0.6F ⊡

6.175 GHZ K(1) + 0.6F — · —

11.2 GHZ K(1) + 0.6F ⊙

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USE OF FLAT EARTH PROFILE FOR WITHIN-THE-HORIZON AND BEYOND-THE-HORIZON RADIO PATHS

1. USE THE SYMBOLS SHOWN BELOW
2. USE A CONVENIENT SCALE FOR DISTANCE AND ELEVATIONS
3. REPRESENT THE PATH AS A STRAIGHT LINE
4. CALCULATE THE EFFECTIVE EARTH CURVATURE TO CORRECT FOR EARTH BULGE AT THE CRITICAL POINTS AND ADD TO THE FLAT EARTH ELEVATION

$$h = \left(\frac{0.667}{K}\right) d_1 d_2$$

WHERE:

- h = HEIGHT OF CORRECTION IN FEET
- K = RATIO OF EFFECTIVE EARTH RADIUS / TRUE EARTH RADIUS
- d_1 = DISTANCE FROM STATION "A" TO POINT UNDER CONSIDERATION IN STATUTE MILES
- d_2 = DISTANCE FROM STATION "B" TO POINT UNDER CONSIDERATION IN STATUTE MILES

5. ADD ANY MAN MADE STRUCTURES AND PERENNIAL GROWTH.
6. CALCULATE THE DESIRED FRESNEL ZONE RADII FOR THE POINTS AND FREQUENCIES UNDER CONSIDERATION USING THE FOLLOWING FORMULAS AND ADD TO THE EXTENDED PROFILE:

$$F_1 = \left[\sqrt{\frac{72}{f_{GHz}}}\right]\left[\sqrt{\frac{d(D-d)}{D}}\right] \quad F_n = \sqrt{n} \cdot F_1$$

WHERE:

- F_1 IS THE RADIUS OF THE FIRST FRESNEL ZONE IN FEET
- f_{GHz} IS THE FREQUENCY UNDER CONSIDERATION IN GIGAHERTZ (10^9 HZ)
- d IS THE DISTANCE IN MILES FROM ONE END OF THE PATH TO THE POINT UNDER CONSIDERATION
- D IS THE TOTAL PATH LENGTH IN MILES
- F_n IS THE RADIUS OF THE n^{TH} FRESNEL ZONE IN FEET
- n IS THE ORDER OF THE FRESNEL ZONE AND CAN BE ANY WHOLE POSITIVE NUMBER

SYMBOLS

- FRESNEL ZONE CLEARANCE
- EARTH CURVATURE FROM K (∞)
- MAN MADE STRUCTURE
- OBSTRUCTION OFF PATH WITHIN 1000 FEET
- PREDICTED VEGETATION GROWTH
- EXISTING HEIGHT OF VEGETATION
- GROUND ELEVATION AMSL K (∞)
- POSSIBLE REFLECTION POINT
- HEIGHT OF FINAL RADIATOR CENTERLINE ABOVE GROUND

STATION (A) HATTONTOWN
LAT 38 · 56 · 31 · N
LONG 77 · 23 · 04 · W
GROUND ELEV 388 FEET ABOVE MEAN SEA LEVEL
REQUIRED HEIGHT OF FINAL RADIATOR CENTER LINE _____ FEET ABOVE GROUND
AZIMUTH (A) TO (B) 100 · 08 · 00 · CW FROM TRUE NORTH

STATION (B) TYSONS CORNER
LAT 38 · 55 · 13 · N
LONG 77 · 13 · 98 · W
GROUND ELEV 519 FEET ABOVE MEAN SEA LEVEL
REQUIRED HEIGHT OF FINAL RADIATOR CENTER LINE _____ FEET ABOVE GROUND
AZIMUTH (B) TO (A) 280 · 13 · 49 · CW FROM TRUE NORTH
FRESNEL CALCULATIONS MADE FOR 2/11/6 GIGAHERTZ.
MAGNETIC DECLINATION _____ · _____ OF TRUE NORTH
PATH AZIMUTHS AND DISTANCES ARE _____ SCALED. X INVERSE POSITION _____ OTHER

CERTIFICATION	EARTH PROFILE	CLEARANCE CRITERIA BY:
SURVEY BY: C Long DATE: 5/86	CUSTOMER OTI	CLIENT ☐ SURVEYOR ☐
DRAWN BY: C L DATE: 5/86	SYSTEM HATTONTOWN TO LANGLEY	DESIGN DEPARTMENT ☐
REVISED BY: DATE:		OTHER ☐ _____

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(1)

MICROWAVE PATH PROFILE DATUM

SITE: HATTON TOWN — SITE: TYSONS CORNER

LAT: 38 • 56 ' 31 " — LAT: 38 • 55 ' 13 "

LONG: 77 • 23 ' 04 " — LONG: 77 • 13 ' 48 "

ELEVATION: 388 'ASML — ELEVATION: 519 'ASML

AZIMUTH FORWARD: 100 • 08 '00 " — AZIMUTH REVERSE: 280 • 13 ' 49 "

PATH DISTANCE: 85 — FREQUENCY: 11.2 GHz & 11.78

FREQ 11.2 / 6.175 — FREQ = 11.78

DIST	ELEV	OBST	K(1) +4/3 F	K(1) +4/3 F	NOTE
0	398				
0.2	398				
0.3	376				
0.4	395				
0.6	386				
0.7	450		(563.6) (-.6)		
1.05	462	T=74' * F6=10	5.2 — 12.9 / 16.7 (-.6) (567.0	(36,3) (5823 5.2 + 31.1	GROUP OF DECIDUOUS TREES APARTMENT COMPLEX AREA
1.1	492				* SINGLE LARGE 81 DECIDUOUS TREE IS 31' NORTH PATH FROM EXISTING TOWER
1.2	400				
1.4	420				
1.45	390				
1.55	425				
1.6	410				
1.65	428				
1.7	400				
1.75	427				
1.8	418				
2.0	360				
2.1	375				
2.2	355				
2.25	392				
2.8	350				
2.9	374				
3.0	290	W			
3.1	365				
3.3	255				
3.4	270				
3.5	255				

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(2)

MICROWAVE PATH PROFILE DATUM

SITE: HATTONTOWN SITE: TYSONS CORNER

LAT: ° ' " LAT: ° ' "

LONG: ° ' " LONG: ° ' "

ELEVATION: 'ASML ELEVATION: 'ASML

AZIMUTH FORWARD: ° ' " AZIMUTH REVERSE: ° ' "

PATH DISTANCE: FREQUENCY:

11,2/6,175 1,78

DIST	ELEV	OBST	K( ) +.6F	K( ) +.6F	NOTE
3,75	342				
4,0	240				
4,15	270				
4,2	225				
4,3	270				
4,4	215				
4,5	225				
5,0	227				
5,15	310				
5,3	295				
5,6	365				
5,7	340		(53,1) (12,2) 23,1 (33,1) (537,1)	(557,0) (53,0)	
6,0	408	T=96' FG=0	10,0 +	10,0 +93,0	SEVERAL LARGE OAK AROUND HOUSE
6,1	388				
6,2	394				
6,5	339				
6,8	408	T=79' FG=10			GROVE DECIDUOUS
6,9	412				
7,1	386				
7,2	396				
7,3	412				
7,4	375				
7,5	406				
7,6	400		(568,9) (13,9)	(584,6) (29,6)	
7,8	463	T=88' FG=5'	3,6 10,3 13,9	3,6 +26,0	GROUP DECIDUOUS
8,1	416		(17,5)		
8,2	480		(572,5)		
8,3	519				

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STATION A: Tysons Corner	STATION B: CIA Langley
LATITUDE: 38° 55' 13" N	LATITUDE: 38° 57' 11" N
LONGITUDE: 77° 13' 48" W	LONGITUDE: 77° 08' 41" W
GROUND ELEV. AMSL: 519 feet	GROUND ELEV. AMSL: 210 feet
HEIGHT OF FINAL RADIATOR CENTER-LINE ABOVE GROUND: 200 feet	HEIGHT OF FINAL RADIATOR CENTER-LINE ABOVE GROUND: 140 feet
AZIMUTH A TO B: 63° 46' 15" (True)	AZIMUTH B TO A: 243° 49' 28" (True)
PATH LENGTH: 5.1 miles	FRESNEL ZONE FREQUENCY: 11.2 GHz

METHOD OF DETERMINING PROFILE:

The profile was determined from 1:24000 scale mapping supplemented by field data.

METHOD OF DETERMINING CRITICAL POINT LOCATION AND ELEVATION:

Critical points were determined by vertical angulation from both CIA Langley and Tysons Corner with direct field measurements.

GENERAL DESCRIPTION OF VEGETATION AND MAN-MADE OBSTACLES ON PATH:

The pathline crosses over gently rolling terrain vegetated by alternating open graded pasture land and groups or groves of mature deciduous trees. From mile 0.2 to 0.5 there is construction of a large 3 story mall with high rise buildings planned for the future. No high rise plans have, at the time of the survey, been submitted by developers to the planning commision. The obstruction at mile 4.65 is a grove of deciduous trees.

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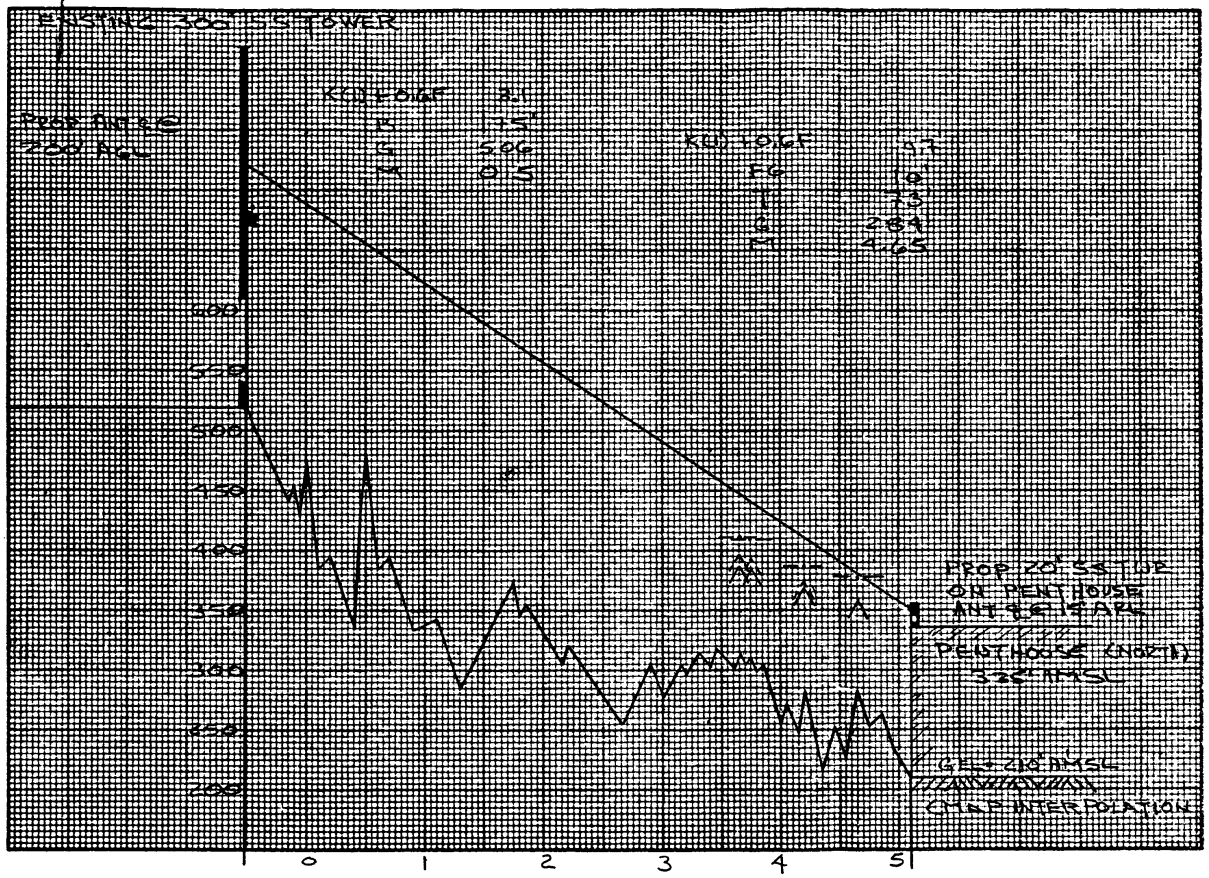

EARTH PROFILE
(ENGLISH UNITS) (K=INFINITY)

SYSTEM HATTON TOWN — CIA LANGLEY

VERTICAL SCALE [50] FEET—ELEVATION PER MAJOR DIVISION

HORIZONTAL SCALE [½] MILES—PATH PER MAJOR DIVISION

STATION (A) TYSONS CORNER

STATION (B) LANGLEY CIA (NORTH PENTHOUSE)

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USE OF FLAT EARTH PROFILE FOR WITHIN-THE-HORIZON AND BEYOND-THE-HORIZON RADIO PATHS

1. USE THE SYMBOLS SHOWN BELOW.
2. USE A CONVENIENT SCALE FOR DISTANCE AND ELEVATIONS.
3. REPRESENT THE PATH AS A STRAIGHT LINE.
4. CALCULATE THE EFFECTIVE EARTH CURVATURE TO CORRECT FOR EARTH BULGE AT THE CRITICAL POINTS AND ADD TO THE FLAT EARTH ELEVATION.

$$h = \left(\frac{0.667}{K}\right) d_1 d_2$$

WHERE:

- h = HEIGHT OF CORRECTION IN FEET
- K = RATIO OF EFFECTIVE EARTH RADIUS / TRUE EARTH RADIUS
- d_1 = DISTANCE FROM STATION "A" TO POINT UNDER CONSIDERATION IN STATUTE MILES
- d_2 = DISTANCE FROM STATION "B" TO POINT UNDER CONSIDERATION IN STATUTE MILES

5. ADD ANY MAN MADE STRUCTURES AND PERENNIAL GROWTH.
6. CALCULATE THE DESIRED FRESNEL ZONE RADII FOR THE POINTS AND FREQUENCIES UNDER CONSIDERATION USING THE FOLLOWING FORMULAS AND ADD TO THE EXTENDED PROFILE.

$$F_1 = \left[\frac{72}{f_{GHz}}\right]\left[\sqrt{\frac{d(D-d)}{D}}\right] \quad F_n = \sqrt{n} \cdot F_1$$

WHERE:

- F_1 IS THE RADIUS OF THE FIRST FRESNEL ZONE IN FEET.
- f_{GHz} IS THE FREQUENCY UNDER CONSIDERATION IN GIGAHERTZ (10⁹ HZ).
- d IS THE DISTANCE IN MILES FROM ONE END OF THE PATH TO THE POINT UNDER CONSIDERATION.
- D IS THE TOTAL PATH LENGTH IN MILES.
- F_n IS THE RADIUS OF THE n^{TH} FRESNEL ZONE IN FEET.
- n IS THE ORDER OF THE FRESNEL ZONE AND CAN BE ANY WHOLE POSITIVE NUMBER.

SYMBOLS

- FRESNEL ZONE CLEARANCE
- EARTH CURVATURE FROM K (∞)
- MAN MADE STRUCTURE
- OBSTRUCTION OFF PATH WITHIN 1000 FEET
- PREDICTED VEGETATION GROWTH
- EXISTING HEIGHT OF VEGETATION
- GROUND ELEVATION AMSL K (∞)
- POSSIBLE REFLECTION POINT
- HEIGHT OF FINAL RADIATOR CENTERLINE ABOVE GROUND

STATION (A) TYSONS CORNER
LAT 38 · 55 · 13 · N
LONG 77 · 13 · 48 · W
GROUND ELEV 519 FEET ABOVE MEAN SEA LEVEL
REQUIRED HEIGHT OF FINAL RADIATOR CENTER LINE 200 FEET ABOVE GROUND
AZIMUTH (A) TO (B) 63 · 96 · 15 · CW FROM TRUE NORTH

STATION (B) CIA LANGLEY (NORTH P.H.)
LAT 38 · 57 · 11 · N
LONG 77 · 08 · 91 · W
GROUND ELEV 210 FEET ABOVE MEAN SEA LEVEL
REQUIRED HEIGHT OF FINAL RADIATOR CENTER LINE 15' AGL FEET ABOVE GROUND
AZIMUTH (B) TO (A) 243 · 99 · 28 · CW FROM TRUE NORTH
FRESNEL CALCULATIONS MADE FOR 11.2 GIGAHERTZ.
MAGNETIC DECLINATION · · OF TRUE NORTH
PATH AZIMUTHS AND DISTANCES ARE ____ SCALED, X INVERSE POSITION, ____ OTHER

CERTIFICATION	EARTH PROFILE	CLEARANCE CRITERIA BY:
SURVEY BY: G LINK DATE: 5/22 DRAWN BY: G LINK DATE: REVISED BY: DATE:	CUSTOMER 071 SYSTEM HATTON TOWN TO CIA LANGLEY	CLIENT ☐ SURVEYOR ☒ DESIGN DEPARTMENT ☐ OTHER ☐

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(1)

MICROWAVE PATH PROFILE DATUM

SITE: TYSONS CORNER
LAT: 38 ° 55 ' 13 "
LONG: 77 ° 13 ' 48 "

SITE: LANGLEY CIA (NORTH PENTHOUSE)
LAT: 38 ° 57 ' .11 "
LONG: 77 ° 08 ' 41 "

ELEVATION: 519 'ASML

ELEVATION: 210 'ASML (MAP INTEPOLATION)

AZIMUTH FORWARD: 63 ° 46 ' 15 "

AZIMUTH REVERSE: 243 ° 49 ' 28 "

PATH DISTANCE: 5.1

FREQUENCY: 11,264 11,2 GHz

DIST	ELEV	OBST	K(1) +.6F	K( ) + F	NOTE
0	519	TWR=300			
0,05	506	B=175	3,1 (684,1) 0,2 2,9		
0,35	440				
0,4	455				
0,45	428				
0,5	476				
0,6	385				
0,7	394				
0,9	335				
1,1	342				
1,3	285				
1,4	305				
1,75	376				
1,8	345				
1,85	354				
2,15	305				
2,2	322				
2,65	255				
2,9	305				
3,0	278				
3,15	304				
3,2	297				
3,3	314				
3,4	302				
3,45	317				
3,6	300				
3,65	314	F=71 F6=10	16,6 (411,6) 3,5 413,1		

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MICROWAVE PATH PROFILE DATUM

SITE: TYSONS CORNER
LAT: ° ' "
LONG: ° ' "
ELEVATION: 'ASML
AZIMUTH FORWARD: ° ' "
PATH DISTANCE: 5.1

SITE: LANGLEY CIA (NORTH PENTHOUSE)
LAT: ° ' "
LONG: ° ' "
ELEVATION: 'ASML
AZIMUTH REVERSE: ° ' "
FREQUENCY:

DIST	ELEV	OBST	K( ) +0.6F	K( ) + F	NOTE
3.7	304				
3.75	310	T=74 F6=10	16.3 (410.3) 3.4 +12.9		
3.8	298				
3.85	302				
4.0	255				
4.05	272				
4.15	248				
4.2	283	T=86 F6=5	13.6 (387.6) 2.5 +11.1		
4.35	215				
4.45	252				
4.55	226				
4.65	284	T=73 F6=10	9.7 376.7 1.9 +8.3		
4.75	254				
4.85	263				
4.95	230	-			NEW TTS BLDG 25' NORTH PATH
5.1	210 (MAP INTERPOLATION)	B=125			

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PATH DESCRIPTION

STATION A: Hattontown	STATION B: CIA Langley
LATITUDE: 38° 56' 31" N	LATITUDE: 38° 57' 11" N
LONGITUDE: 77° 23' 04" W	LONGITUDE: 77° 08' 41" W
GROUND ELEV. AMSL: 388 feet	GROUND ELEV. AMSL: 210 feet
HEIGHT OF FINAL RADIATOR CENTER-LINE ABOVE GROUND:	HEIGHT OF FINAL RADIATOR CENTER-LINE ABOVE GROUND:
AZIMUTH A TO B: 86° 31' 41" (True)	AZIMUTH B TO A: 266° 40' 43" (True)
PATH LENGTH: 12.9 miles	FRESNEL ZONE FREQUENCY: 6.175,11.2 GHz

METHOD OF DETERMINING PROFILE:

The profile was determined from 1:24000 scale mapping supplemented by field data.

METHOD OF DETERMINING CRITICAL POINT LOCATION AND ELEVATION:

Critical point at mile 1.15 was determined by vertical and horizontal triangulation from Hattontown. The obstruction point at mile 9.05 was determined by vertical and horizontal angulation from both Hattontown and CIA Langley. Direct obstruction measurements were taken.

GENERAL DESCRIPTION OF VEGETATION AND MAN-MADE OBSTACLES ON PATH:

The pathline crosses over gently rolling hills vegetated by alternating fairly dense groups and groves of mainly deciduous trees with open areas. The population use alternates between residential apartments and office buildings. New office buildings are being developed between mile 2.5 to 3.0 and mile 3.5 to 3.9. Zoning is this area allows a height of up to 75 feet without zone variance. At mile 1.15 there is a group of tall deciduous trees. At mile 9.05 there is a mature grove of deciduous trees.

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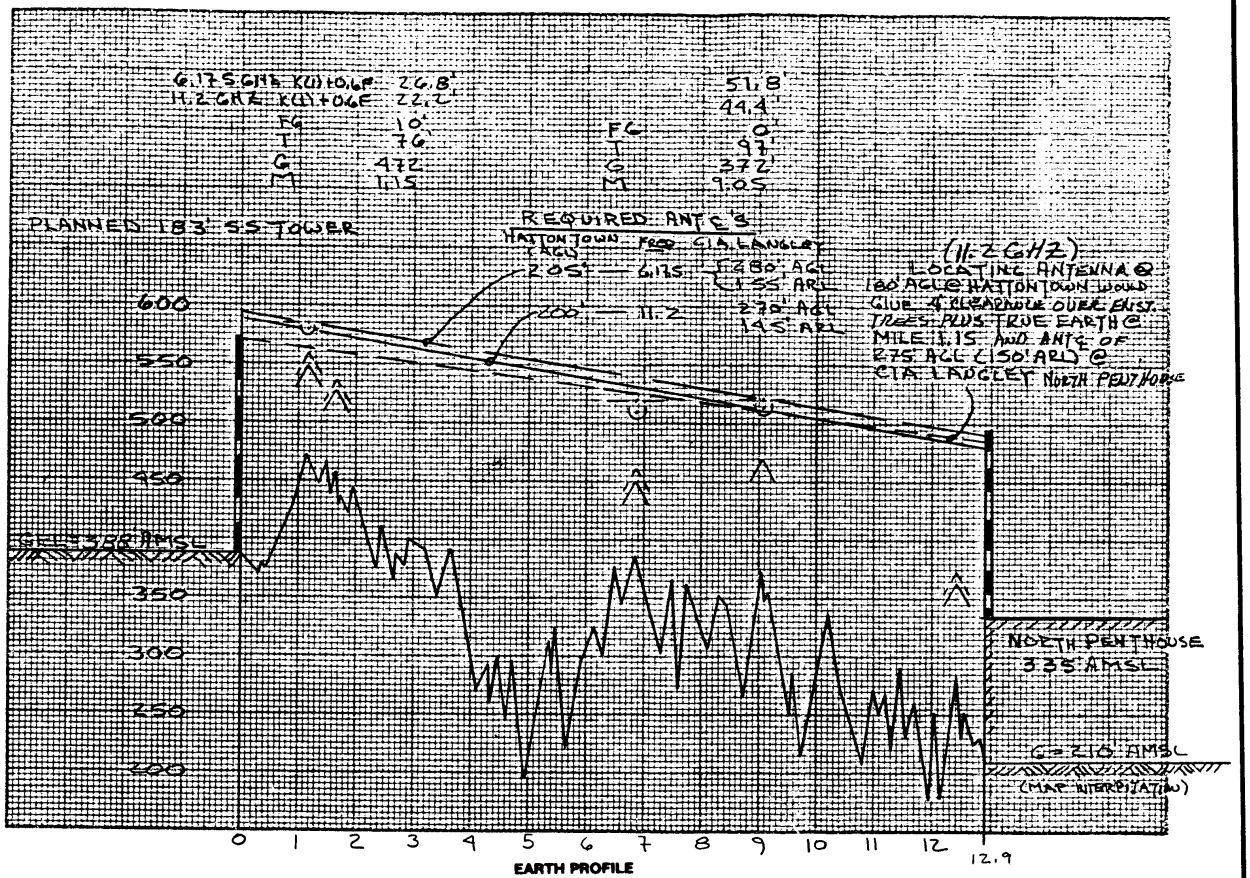

EARTH PROFILE
(ENGLISH UNITS) (K=INFINITY)

SYSTEM HATTONTOWN - CIA LANGLEY

VERTICAL SCALE 50 **FEET—ELEVATION PER MAJOR DIVISION**

HORIZONTAL SCALE 1 **MILES—PATH PER MAJOR DIVISION**

STATION (A) HATTONTOWN

STATION (B) CIA LANGLEY (NORTH PENTHOUSE)

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USE OF FLAT EARTH PROFILE FOR WITHIN-THE-HORIZON AND BEYOND-THE-HORIZON RADIO PATHS

1. USE THE SYMBOLS SHOWN BELOW
2. USE A CONVENIENT SCALE FOR DISTANCE AND ELEVATIONS
3. REPRESENT THE PATH AS A STRAIGHT LINE
4. CALCULATE THE EFFECTIVE EARTH CURVATURE TO CORRECT FOR EARTH BULGE AT THE CRITICAL POINTS AND ADD TO THE FLAT EARTH ELEVATION

$$h = \left(\frac{0.667}{K}\right) d_1 d_2$$

WHERE:

- h = HEIGHT OF CORRECTION IN FEET
- $K = \frac{\text{RATIO OF EFFECTIVE EARTH RADIUS}}{\text{TRUE EARTH RADIUS}}$
- d_1 = DISTANCE FROM STATION "A" TO POINT UNDER CONSIDERATION IN STATUTE MILES
- d_2 = DISTANCE FROM STATION "B" TO POINT UNDER CONSIDERATION IN STATUTE MILES

5. ADD ANY MAN MADE STRUCTURES AND PERENNIAL GROWTH.
6. CALCULATE THE DESIRED FRESNEL ZONE RADII FOR THE POINTS AND FREQUENCIES UNDER CONSIDERATION USING THE FOLLOWING FORMULAS AND ADD TO THE EXTENDED PROFILE:

$$F_1 = \left[\sqrt{\frac{72}{f_{GHz}}}\right]\left[\sqrt{\frac{d(D-d)}{D}}\right] \qquad F_n = \sqrt{n} \cdot F_1$$

WHERE:

- F_1 IS THE RADIUS OF THE FIRST FRESNEL ZONE IN FEET
- f_{GHz} IS THE FREQUENCY UNDER CONSIDERATION IN GIGAHERTZ (10^9 HZ)
- d IS THE DISTANCE IN MILES FROM ONE END OF THE PATH TO THE POINT UNDER CONSIDERATION
- D IS THE TOTAL PATH LENGTH IN MILES
- Fn IS THE RADIUS OF THE n^{TH} FRESNEL ZONE IN FEET
- n IS THE ORDER OF THE FRESNEL ZONE AND CAN BE ANY WHOLE POSITIVE NUMBER

SYMBOLS

- FRESNEL ZONE CLEARANCE
- EARTH CURVATURE FROM K (∞)
- MAN MADE STRUCTURE
- OBSTRUCTION OFF PATH WITHIN 1000 FEET
- PREDICTED VEGETATION GROWTH
- EXISTING HEIGHT OF VEGETATION
- GROUND ELEVATION AMSL K (∞)
- POSSIBLE REFLECTION POINT
- HEIGHT OF FINAL RADIATOR CENTERLINE ABOVE GROUND.

STATION (A) HATTONTOWN
LAT 38 · 56 · 31 · N
LONG 77 · 23 · 04 · W
GROUND ELEV 388 FEET ABOVE MEAN SEA LEVEL
REQUIRED HEIGHT OF FINAL RADIATOR CENTER LINE _____ FEET ABOVE GROUND
AZIMUTH (A) TO (B) 86 · 31 · 41 · CW FROM TRUE NORTH

STATION (B) CIA LANGLEY (NORTH P.H.)
LAT 38 · 57 · 11 · N
LONG 77 · 08 · 41 · W
GROUND ELEV 210 FEET ABOVE MEAN SEA LEVEL
REQUIRED HEIGHT OF FINAL RADIATOR CENTER LINE _____ FEET ABOVE GROUND
AZIMUTH (B) TO (A) 266 · 40 · 93 · CW FROM TRUE NORTH
FRESNEL CALCULATIONS MADE FOR 11.2/6.175 GIGAHERTZ.
MAGNETIC DECLINATION _____ OF TRUE NORTH
PATH AZIMUTHS AND DISTANCES ARE: _____ SCALED, X INVERSE POSITION, _____ OTHER

CERTIFICATION	EARTH PROFILE	CLEARANCE CRITERIA BY:
SURVEY BY: GL DATE: 5/86 DRAWN BY: GL DATE: 5/86 REVISED BY: DATE:	CUSTOMER OTI SYSTEM HATTONTOWN TO CIA LANGLEY	CLIENT ☐ SURVEYOR ☐ DESIGN DEPARTMENT ☐ OTHER ☐

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MICROWAVE PATH PROFILE DATUM

SITE: HATTONTOWN
LAT: 38 • 56 ' 31 "
LONG: 77 • 23 ' 04 "
ELEVATION: 388 'ASML
AZIMUTH FORWARD: 86 • 31 ' 41 "
PATH DISTANCE: 12.9

SITE: LANGLEY CIA (NORTH PENTHOUSE)
LAT: 38 • 57 ' 11 "
LONG: 77 • 08 ' 41 "
ELEVATION: 210 'ASML (MAP INTERPITATION ONLY)
AZIMUTH REVERSE: 266 • 40 ' 43 "
FREQUENCY:

DIST	ELEV	OBST	11.2 GHz K(1) +0.6F	6.175 GHz K(1) +0.6F	NOTE
0	388				
0.3	371				
0.35	379				
0.45	375				
0.9	430				
1.15	472	T=76' F6=10	22.2 (580.2) 9.0 + 13.2	26.3 (584.8) 9.0 + 17.8	GROUP DECIDUOUS TREES IN APT COMPLEX
1.35	447				
1.5	466				
1.55	439				
1.65	457	T=68 F6=10	12.4 + 15.5	33.3 (568.2) 12.4 + 20.9	GROUP DECIDUOUS TREES IN APT COMPLEX
1.7	428				
1.75	437				
1.8	424				
1.95	443				
2.35	376				
2.45	412				
2.65	366				
2.7	384				
2.85	378				
2.9	400				
3.2	392				
3.4	350				
3.65	393				
4.1	270				
4.3	295				
4.35	258				
4.45	300				

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MICROWAVE PATH PROFILE DATUM

SITE: HATTONTOWN
LAT: • ' "
LONG: • ' "
ELEVATION: 'ASML
AZIMUTH FORWARD: • ' "
PATH DISTANCE:

SITE: LANGLEY, CIA (NORTH PENTAGON)
LAT: • ' "
LONG: • ' "
ELEVATION: 'ASML
AZIMUTH REVERSE: • ' "
FREQUENCY:

DIST	ELEV	OBST	K( ) + F	K( ) + F	NOTE:
4.6	245				
4.7	295				
4.9	195				
5.35	312				
5.4	285				
5.45	325				
5.65	225				
5.9	295				
6.15	326				
6.3	300				
6.5	376				
6.6	345				
6.85	386	T=64' F6=10	50.7 (510.7) 27.6 + 23.1	58.8 (518.8) 27.6 + 31.2	GROUP DECIDUOUS TREES BY RESIDENCES
7.3	302				
7.5	367				
7.6	275				
7.75	362				
8.1	308				
8.3	352	T=78' F6=10			
8.45	344				
8.75	266				
9.05	372	T=97' F6=0	49.4 (513.4) 23.2 + 21.2	51.8 (520.8) 23.2 + 28.6	GROUP LARGE DECIDUOUS TREES
9.1	348				
9.15	354				
9.5	258				
9.55	286				
9.7	215				

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MICROWAVE PATH PROFILE DATUM

SITE: HATTON TOWN
LAT: ° ' "
LONG: ° ' "
ELEVATION: 'ASML
AZIMUTH FORWARD: ° ' "
PATH DISTANCE:

SITE: LANGLEY CIA (NORTH PENTHOUSE)
LAT: ° ' "
LONG: ° ' "
ELEVATION: 'ASML
AZIMUTH REVERSE: ° ' "
FREQUENCY:

DIST	ELEV	OBST	K( ) + F	K( ) + F	NOTE
10.2	336	T=65 FG=10			
10.4	275				
10.8	208				
11.0	272				
11.1	250				
11.2	268				
11.3	220				
11.45	292	T=63' FG=10			GROUP DECIDUOUS TREES
11.55	230				
11.7	262				
11.95	175				
12.05	252				
12.25	178				
12.4	283	T=79 FG=10	13.0 (385.0) 4.1 + 8.9	16.1 (388.2) 4.1 + 12.0	GROUP DECIDUOUS TREES
12.5	230				
12.55	251				
12.7	225				
12.8	230	B=15'			NEW BLDG UNDER CONST. ADJ. CIA OFFICE
12.9	210				

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